

INVESTIGATION OF THE EFFECT OF
STIFFNESS OF MEMBERS UPON
THE SOLUTION OF VIERENDEEL TRUSSES

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Thesis
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UPON THE SOLUTION OF VIERENDEEL TRUSSES

by

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Introduction

A Vierendeel Truss is composed of a series of rectangular or trapezoidal panels without diagonal members. It is named for its inventor, Professor Arthur Vierendeel of the University of Louvain in Belgium. This type of truss has been popular in Europe, particularly in Belgium, since 1896 when the first bridge of this type was built in that country. In the United States its use to date has been limited to concrete viaduct bents, small roof trusses, and rigid frame foundations for buildings. It has been reported that a bridge using a concrete Vierendeel Truss system has been built recently on the West Coast, but as yet there is no printed matter available on that project.

The Vierendeel presents an exceptionally good appearance, the elimination of diagonals allowing a very clean looking structure. Its slow adaption in this country may be attributed to two factors; (1) until recently the only methods of solution were extremely long and tedious, sufficiently so to discourage only the most able and experienced in the field of structural design, and (2) the use of this truss has been so limited in this country that very few examples are available from which to make an intelligent investigation of the economic aspects of the problem.

METHOD OF SOLUTION

The method of solution used throughout this thesis was an application of slope deflection as outlined by Mr. A. Amirikian in his "Analysis of Rigid Frames". While there are other methods available for the solution of Vierendeel trusses it was felt that the procedure outlined by Mr. Amirikian was the simplest and most direct approach to the problem published to date. Inasmuch as his text has become a standard addition to all libraries of treatises on Indeterminate Structures, none of the derivations will be presented here and only a brief outline of the basic formulae and procedures will be given.

By way of simplifying the fundamental moment equation of a member having constant moment of inertia and modulus of elasticity

$$M_{AB} = 2 E \frac{I}{L} (2\theta_A + \theta_B - 3 \frac{\Delta}{L}) - FM_{AB}$$

the following abbreviated form is used

$$M_{AB} = K (A + \frac{B}{2} - R) - FM_{AB}$$

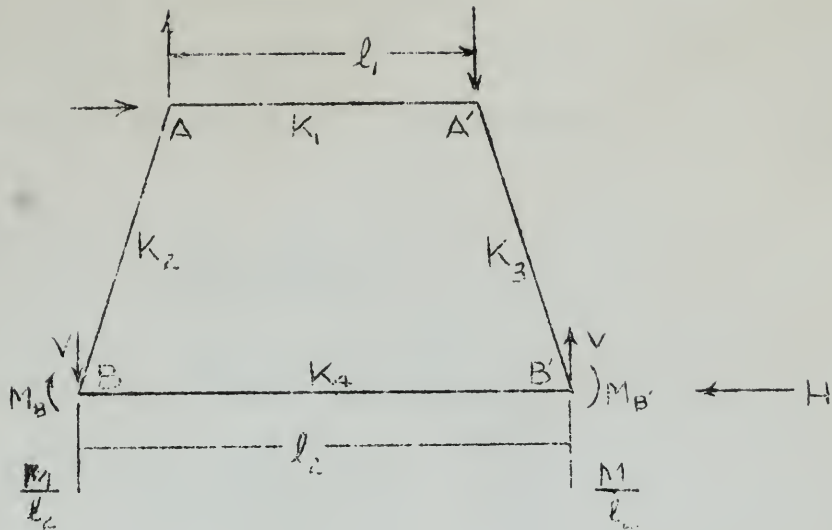
where

$$K = \frac{I}{L} \qquad B = 4E\theta_B$$

$$A = 4 E\theta_A \qquad R = 6E \frac{\Delta}{L}$$

This simplification is used throughout the solution and greatly reduces the tediousness of the more complex equations.

Upon connecting four of these beams to form a panel and a series of panels to form a truss, the interdependence of the members and joints becomes pronounced. In order to consider the effect of varying stiffnesses in members forming or adjacent to a joint on both the moment at the joint and the deflection in the beam, expressions are developed for each joint encountered. These expressions will be known hereafter as the Joint and Deflection Equations. Likewise the moments obtained in the solution of any joint will vary widely with the shape of the panel, moments and shears applied and location of application, and the stiffnesses of the panel under consideration. In order to take these variables into consideration, Load Constant Equations are derived for each joint. Upon solution of these equations the load constant is equated to the Joint and Deflection equations which are then solved to find the deflection angles of the joints and the deflection of the adjacent member. Because of its basic nature the fundamental expression for the load constants of a typical panel are reproduced here in part.



$$(a) \quad M_B + M_{B'} = V l_2 - H$$

$$(b) \quad M_A + M_{A'} + M_B + M_{B'} = V(l_2 - l_1) - Hh$$

Substituting V from (a) in (b)

$$(c) \quad M_A + M_{A'} + (1-m)(M_B + M_{B'}) = mH - Hh$$

where

M = overturning moment of the external forces taken about the bottom of the panel.

H = shear, i.e., the sum of the lateral forces above the panel.

V = vertical reaction just above the bottom joints of the panel.

M_A = end moments at top.

M_B = end moments at bottom.

Q = values of load constant for joint or panel under consideration.

$$m = \frac{l_2 - l_1}{l_2}$$

$$n = \frac{l_1 - l_2}{l_1}$$

By substituting the right hand part of equation (c) in a previously developed shear expression for a typical joint equation we arrive at load constants for a typical panel

$$Q \text{ of } R = \frac{Hh - mM}{(2-m)(k_2 - k_3)}$$

$$Q \text{ of } A = \frac{(nk_1 - k_2)(Hh - mM)}{(2-m)(k_2 - k_3)}$$

$$Q \text{ of } B = \frac{k_2 (mM - Ph)}{(2-m)(k_2 - k_3)}$$

Further importance is attached to equation (c) inasmuch as it acts as a check for the moment values obtained in the solution of any panel.

The procedure for the solution of Vierendeel trusses is an adaptation of this single panel solution. In order to avoid the difficulty of an exact solution the truss is first treated as a system of separate and independent panels. Each panel is solved for its own load neglecting moment introduced from other panels via the joints. To compensate for the error introduced in the original computation the solution is repeated, this time using the moments obtained from adjacent panels as the new load constants for the panel being solved. The procedure is repeated, again interchanging moment increments between panels. Inasmuch as these increments diminish in size rapidly, two corrections will ordinarily provide a solution of sufficient accuracy.

The final moment will be the algebraic sum of the original moment determination and the successive increments.

For the Vierendeel truss used in this design with all loads applied at the panel points and the upper and lower chords having the same stiffness ratio, the deflection angles of the top chord joints will equal those of the respective bottom chord joints, and the joint and deflection equations become:

$$1.5K_1 + K_2 + \frac{(3 - m)(nk_1 - k_2)}{2(2 - m)} A =$$

$$\frac{k_2}{2} + \frac{(3 - 2m)(nk_1 - k_2)}{2(2 - m)} B = -Q_A$$

$$k_2 + 1.5K_4 + \frac{(3 - 2m)k_2}{2(2 - m)} B =$$

$$\frac{k_2}{2} + \frac{(3 - m)k_2}{2(2 - m)} A = -Q_B$$

$$R_1 = \frac{(3 - m)A + (3 - 2m)B}{2(2 - m)} = Q_{R1}$$

These equations, with appropriate K and angle notation are set up for each of the eight panels and equated to the corresponding load constants as obtained from the following formulae:

$$-Q_A = \frac{(nk_1 - k_2)(m\bar{l}_1 - H_1l_1)}{2(2 - m)k_2}$$

$$-Q_B = \frac{(H_1l_1 - m\bar{l}_1)}{2(2 - m)}$$

$$Q_{R1} = \frac{H_1l_1 - m\bar{l}_1}{2(2 - m)k_2}$$

The two equations in A and B obtained from the solutions of these sets of equations are then solved simultaneously and the value for R_1 determined. Substituting in the fundamental moment formulae

$$M_{LB} = K \left(A + \frac{B}{2} - R_1 \right)$$

$$M_{BA} = K \left(B + \frac{A}{2} - R_1 \right)$$

the original moment values for the panel are obtained. These moments are then corrected and the sum of the original moment plus corrections give us the final moment values.

Influence lines were plotted for the final moment values and design moments based on the combined loadings of one E-60 railroad rail and one lane of H15 - S12 - 44 highway loading were computed.

PURPOSE

The purpose of this investigation is to determine the influence of the assumed stiffnesses of the members upon the eventual design of the truss.

In the design of a Vierendeel truss by the method previously described, the first step is to assume a basic truss and loading system. A solution is then worked for this primary system, corrected for the actual loads and conditions, and the solution repeated with appropriate corrections to arrive at the final design, usually three or more solutions being required.

Upon embarking upon this type of solution, the engineer is faced with two fundamental assumptions, (a) the loading to be used, and (b) the stiffnesses to select for his members. The first of these may be handled in the conventional manner, i.e. assume a loading of one kip and compute values for plotting influence lines to which he may later apply his design loads.

The second assumption, selecting appropriate stiffnesses for his members, presents a more difficult problem. Unfortunately so little material has been published on Vierendeel trusses in this country that there is little to guide him in this step.

Likewise the rarity of this type of structure in the United States makes it extremely unlikely that he could obtain any useful data on existing trusses of this type. Obviously it is up to the engineer to make such assumptions as he sees fit. In order to do this properly he should, of course, have some advanced knowledge of the distribution of moments throughout the truss in order that he could correctly proportion his stiffnesses to their appropriate moments. Previous experience lacking, he will be forced to estimate the probable moment intensities and select stiffnesses accordingly. This procedure leaves much to be desired, for regardless of a man's previous experience it is not to be expected that he could closely approximate the distribution of moments in a truss entirely unfamiliar to him, and his stiffness values will be subject to the same degree of uncertainty.

The question now arises as to the degree in which the assumed values of stiffnesses will affect the solution of the truss. It will be noted that the stiffness factor K occurs in four of the six basic equations for the solution, and it might be supposed that any wide variation in the true and assumed values of K would produce a similar

variation in the moment values obtained. It is the purpose of this thesis to determine the effect of widely varying stiffness values upon moments in a typical Vierendeel truss. The case selected was for a 240 foot lift span for a lift bridge across the entrance to a harbor inlet. The span is to carry one lane of highway traffic on each side of a single track standard gauge railway.

FIRST SOLUTION

For the first solution K values were chosen primarily from sample problems accompanying an article on Vierendeel trusses by Mr. Dan Young in the 1937 Proceedings of the A. S. C. E. Whether or not Mr. Young intended that the stiffness values in his problem should closely approximate actual conditions is unknown. On the condition that these values might approximate the trend of moment distribution, our assumed values were made to follow a similar pattern of variation.

SECOND SOLUTION

For the second solution the values of \underline{K} were arrived at by using the moments obtained in the first solution. Since

$$K = \frac{I}{L} = \frac{Mc}{fL}$$

it was possible to solve directly for a value of \underline{K} , inasmuch as members of constant depth (30") were proposed to improve the appearance of the truss and f and L were known values. In this way it was possible to determine the effect of closely approximating moment and stiffness values throughout the truss.

THIRD SOLUTION

For the third solution all K values were assumed to be unity. It was felt that since both moment and stiffness values vary throughout the truss that by holding one of these constant it might be possible to observe the variation of the other. In this way the stiffness values of the second set of computations of any truss might be made to closely approximate the stiffnesses required by the actual moments and thus expedite and simplify the final design of the truss.

FOURTH SOLUTION

For purposes of contrast the stiffness values of the fourth solution were taken exactly opposite to those of the first solution. In other words the same numerical values were used but varying in an inverse order of the first solution. In this way it was hoped to observe the effect of the direction of variations of stiffness values upon the moments computed.

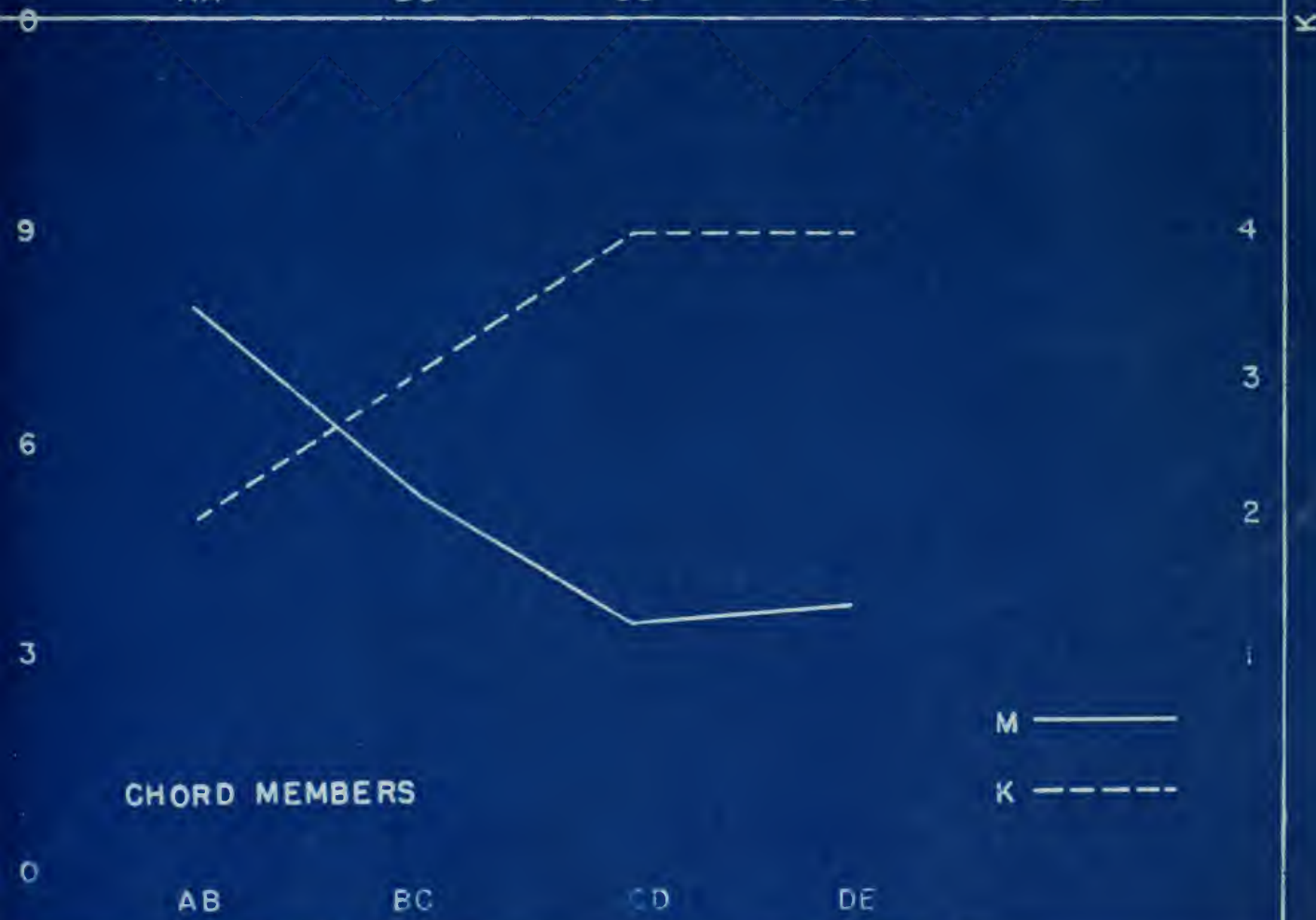
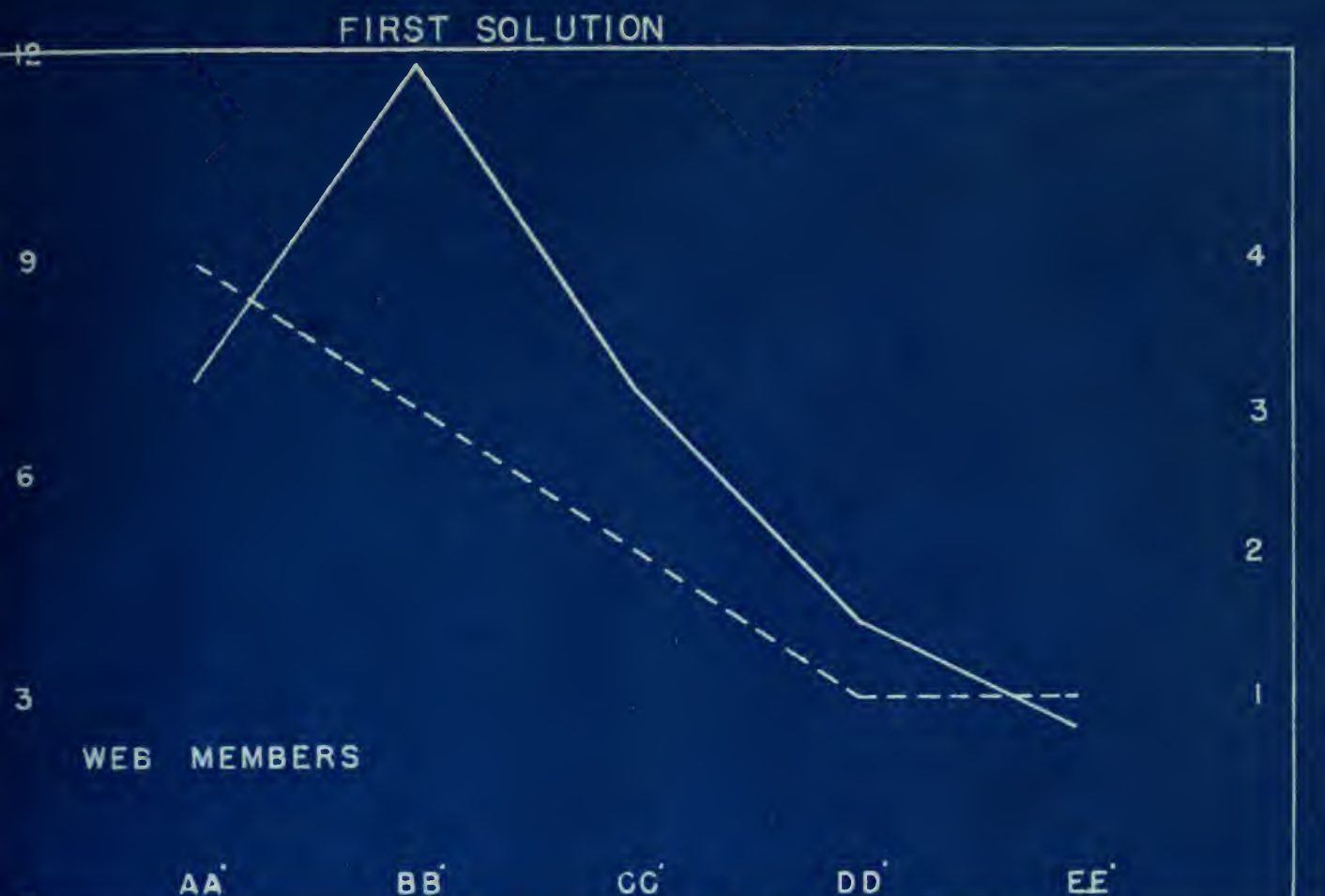
DESIGN MOMENTS

Member	Set 1		Set 2		Set 3		Set 4	
	K	M	K	M	K	M	K	M
AA'	4	7,362	160	7,222	1	7,689	1	7,987
BB'	3	11,745	232	11,762	1	10,600	1	9,030
CC'	2	7,243	136	7,575	1	7,781	2	8,497
DD'	1	4,046	74	4,447	1	5,170	3	5,844
EE'	1	2,593	47	3,000	1	3,282	4	3,435
AB	2	7,958	200	7,212	1	7,689	4	7,987
BC	3	5,360	134	5,492	1	5,465	4	7,329
CD	4	3,548	90	3,529	1	4,043	3	4,436
DE	4	3,790	95	2,877	1	3,020	2	2,986

For purposes of clarity the tabulated results of the moment solutions have been put in graph form on the following pages. Taking web and chord members separately the values of moment and stiffness were plotted for each member for a given solution. The plotted points were then connected in order to indicate the trends of variation of both moment and stiffness. With one exception the moments and stiffnesses as plotted represent the actual values obtained and used in the solution. The one exception is in the case of the second solution. Here the values of K ranged from 200 to 47 and would have been at best unwieldy to plot on the scale adopted. Inasmuch as the numerical value of K appears to affect the solution only in its relative size compared to the other K values the K's for this solution were plotted on a relative scale. By taking $K = 47$ as unity the other K values were reduced to the same relative scale by dividing by 47, greatly simplifying plotting operations and presenting a better method of comparison with the other solutions.

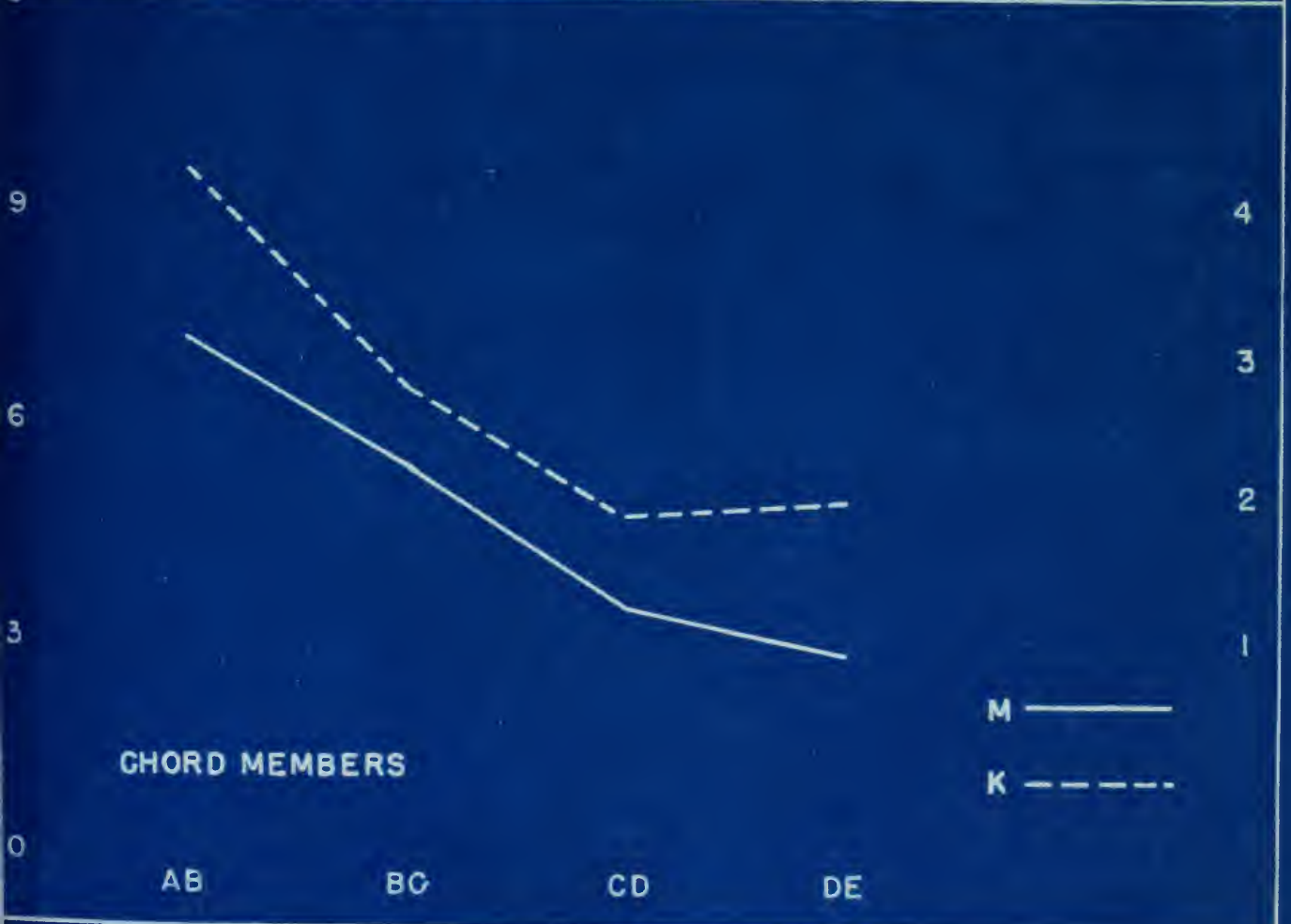
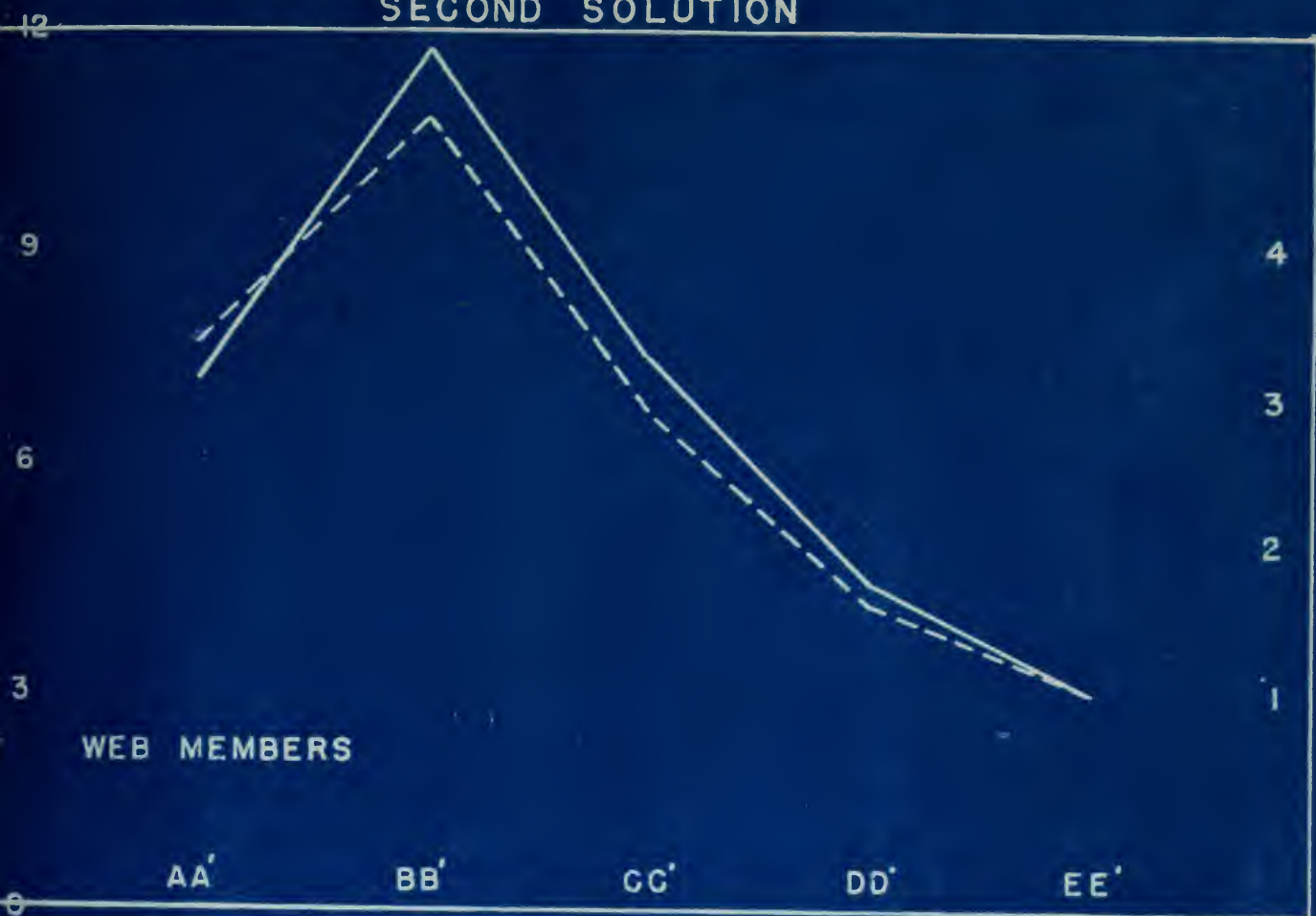
In examining the first solution curves there is little evidence to indicate any direct relationship in the variation of the K values assumed and

the moments obtained. In the case of the web members, CC' and DD' have similar relationships of moment and stiffness. There is an inverse relationship occurring in the case of the other three members. As for the chord members, the inverse relationship exists throughout, high moment values accompanying low stiffness values and vice versa.



The second solution represents a case in which the general trend of moment values closely follows the trend of the stiffness values assumed, with the sole exception of member DE. It is to be noted that there is no proportionality or direct relationship between the values of K and M . While the picture thus presented might seem to indicate a general tendency for moment values to follow stiffness assumptions, it must be remembered that the stiffness values for this solution were obtained directly from the moment values of the previous solution. In effect the moment values have changed but little and by the nature of their assumption it is to be expected that the stiffness values would vary in much the same way as the moment values.

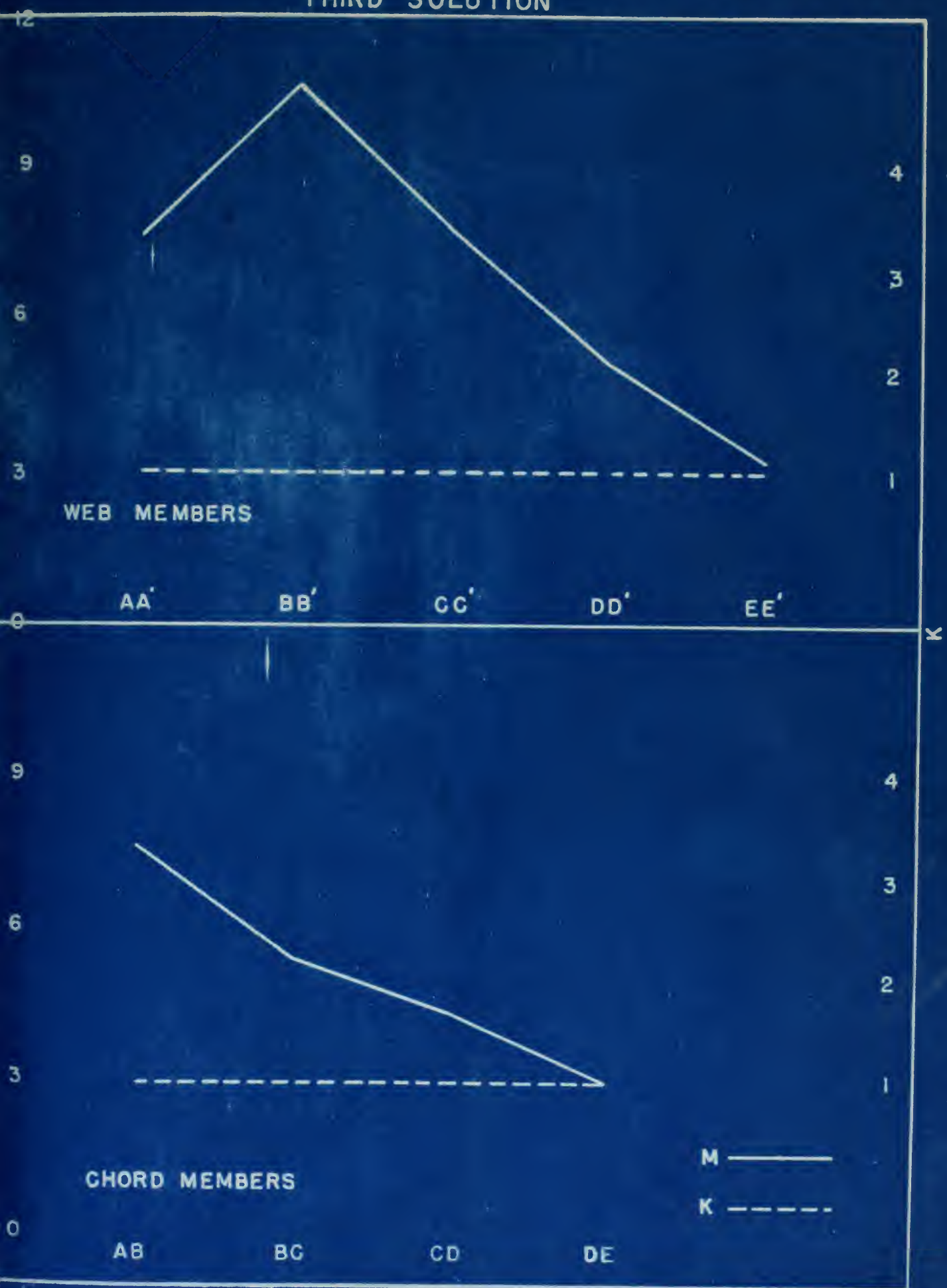
SECOND SOLUTION



The third solution is unique in that it presents an unvarying stiffness curve, all values of K being unity. It is to be noticed that in neither size nor pattern of variation do the moment values differ substantially from the previous solutions. At no place do either of the moment curves display any tendency to follow or parallel the trend of the K values assumed.

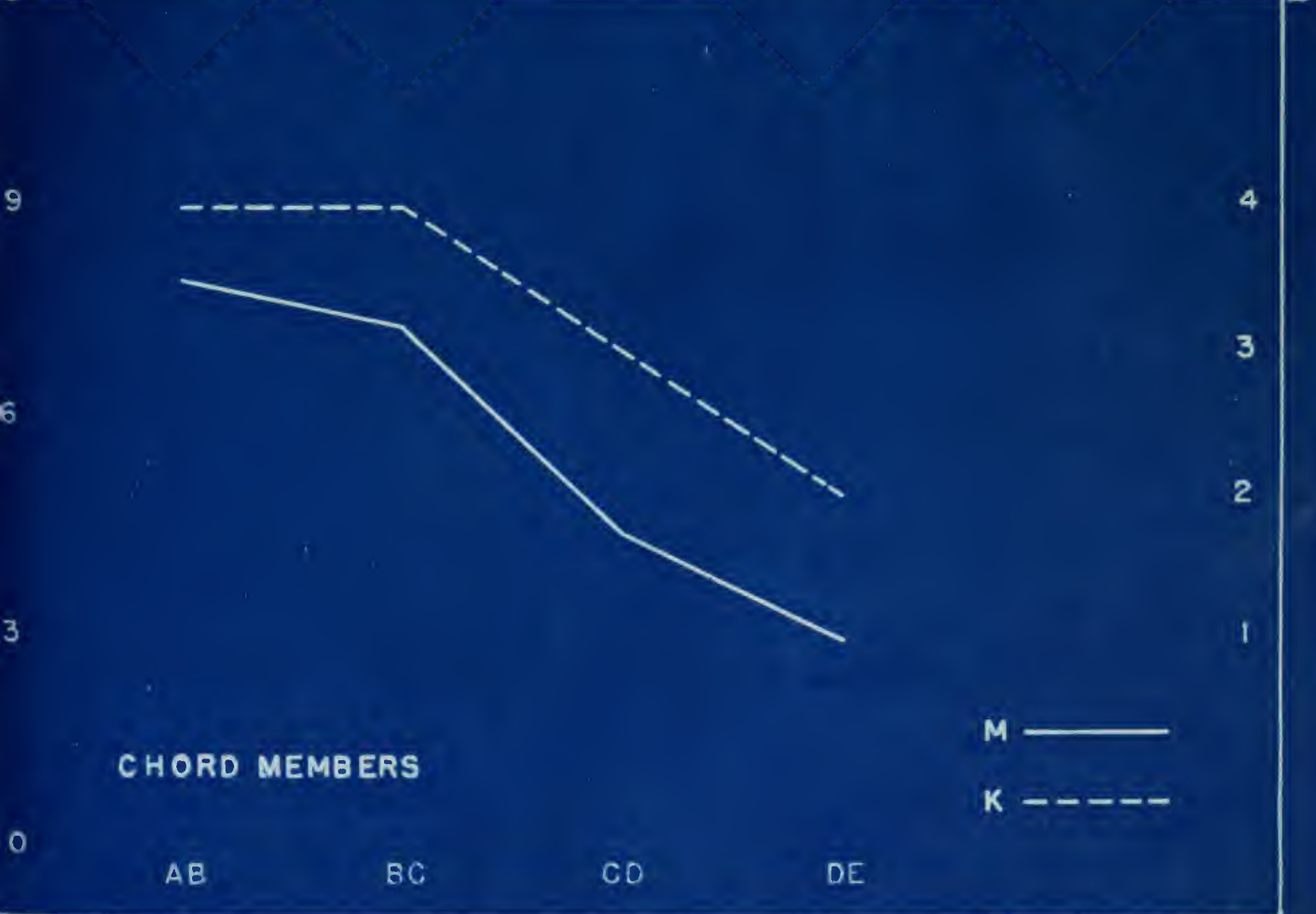
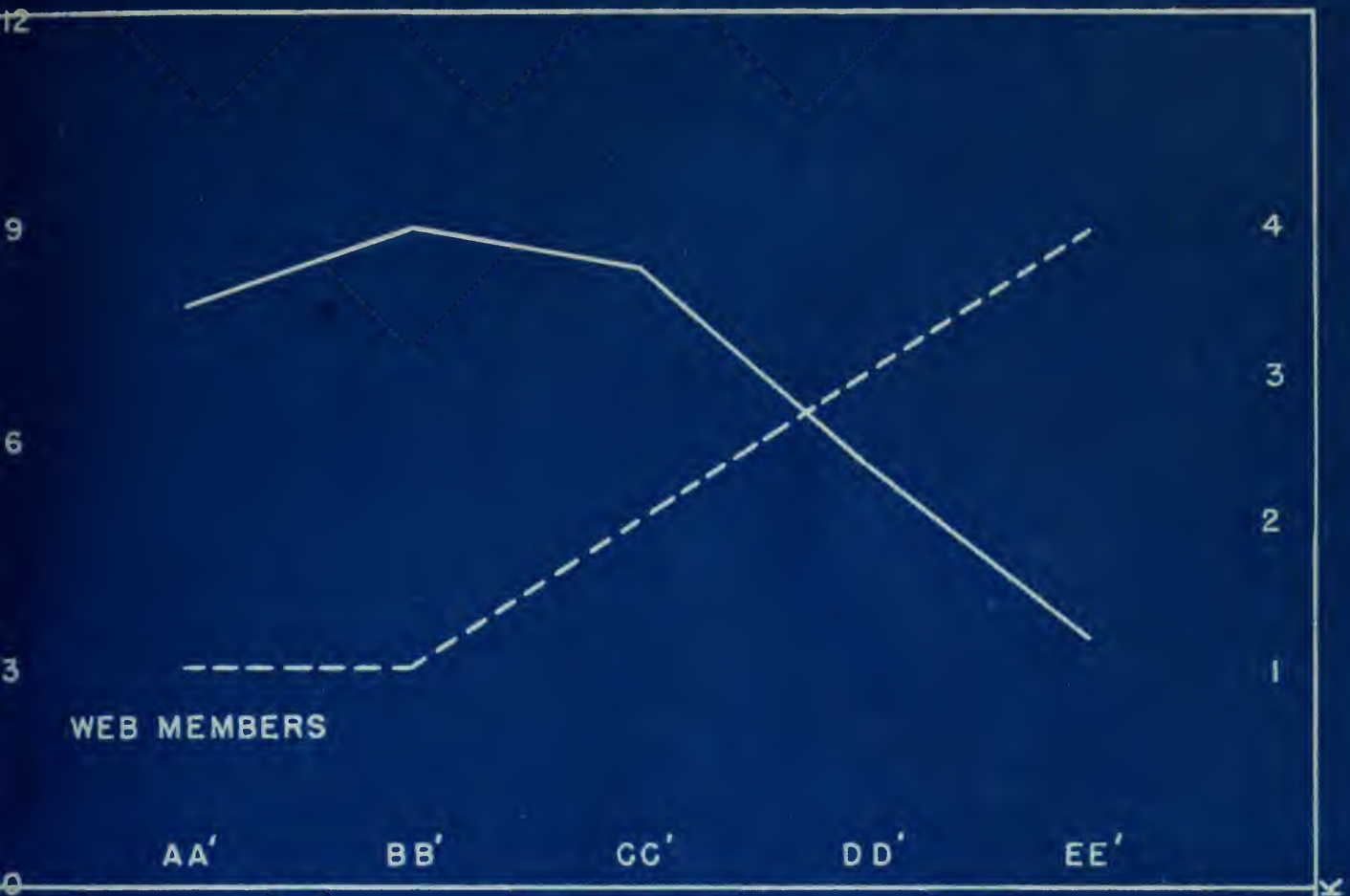
and the other two are the same as the first two.
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The first two are the same as the first two.

THIRD SOLUTION



The fourth solution graph represents a system of stiffness values assumed in an exactly inverse order of those chosen for the first solution. Contrary to the results obtained in that solution we now find that the chord moments tend to follow the same general pattern as their corresponding K values while the web members follow a completely dissimilar path from their K values. As before there is but little variation in either the size or trend of the moments obtained as compared with the resultant moments of the first solution.

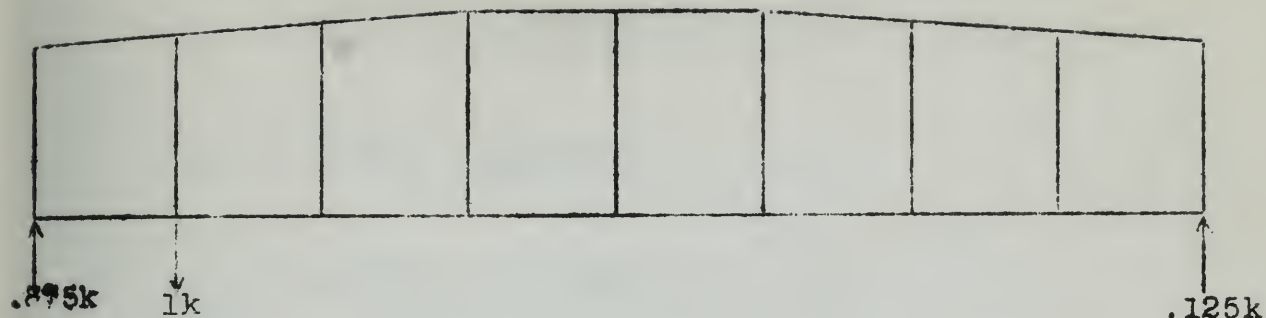
FOURTH SOLUTION



CONCLUSIONS

The results obtained from the four solutions presented show but one common trend, i.e. in no case do the resultant moments of any solution differ widely from those of any other solution. Conversely the stiffness values assumed for any one solution differ widely from those of all other solutions. No relating tendencies are disclosed, a lower stiffness value does not in every case bring a lower moment nor does a higher stiffness value display any significant effect on moments obtained. Likewise a change in the direction of variation of stiffness values seems to have little effect on the moments obtained. Therefore it must be concluded that the size, direction, or degree of variation of assumed values of stiffness of members does not materially affect the moments obtained in the first solution of a Vierendeel truss by this method.

In view of these conclusions it is recommended that in the solution of trusses by this method the first solution be worked with the assumption of all K values as unity. Such an assumption would permit a simpler and quicker solution of the truss with no loss of accuracy.



.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.875	-.125	-.125	-.125	-.125	-.125	-.125	-.125
26.25	22.50	18.75	15.00	-15.00	-11.25	-7.50	-3.75

Panel 1

$$-Q_A = \frac{(.0942 \times 4 - 2)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)2} = 5.32$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.27$$

$$Q_{R1} = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)2} = 3.14$$

Panel 2

$$-Q_B = \frac{(.0463 \times 3 - 3)(.0443 \times 22.5 - .125 \times 30)}{2(2 - .0443)3} = -1.16$$

$$-Q_C = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)3} = -0.40$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 4)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)^4} = -1.16$$

$$-Q_D = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - n)^4} = -.30$$

Panel 4

$$-Q_D = \frac{(0 - 4)(0 + .125 \times 30)}{2(2)^4} = -.94$$

$$-Q_E = \frac{(-.125 \times 30 - 0)}{2 \times 2} = -.94$$

$$Q_{R4} = \frac{-.125 \times 30 - 0}{2(2)^4} = -.23$$

Panel 5

$$-Q_E = \frac{-.125 \times 30}{4} = -.94$$

$$-Q_F = \frac{-.125 \times 30}{4} = -.94$$

$$-Q_{R5} = \frac{-.125 \times 30}{4 \times 4} = -.23$$

Panel 6

$$-Q_G = \frac{(.0517 \times 2 - 4) - (.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)^4} = -.80$$

$$-Q_F = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -.62$$

$$-Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)^4} = -.20$$

Panel 7

$$-Q_H = \frac{(.0463 \times 3 - 3)(.0443 \times -7.5 - -.125 \times 30)}{2(2 -.0443)^3} = -.083$$

$$-Q_G = \frac{(-.125 \times 30 -.0443 \times -.75)}{2(2 -.0443)} = -0.87$$

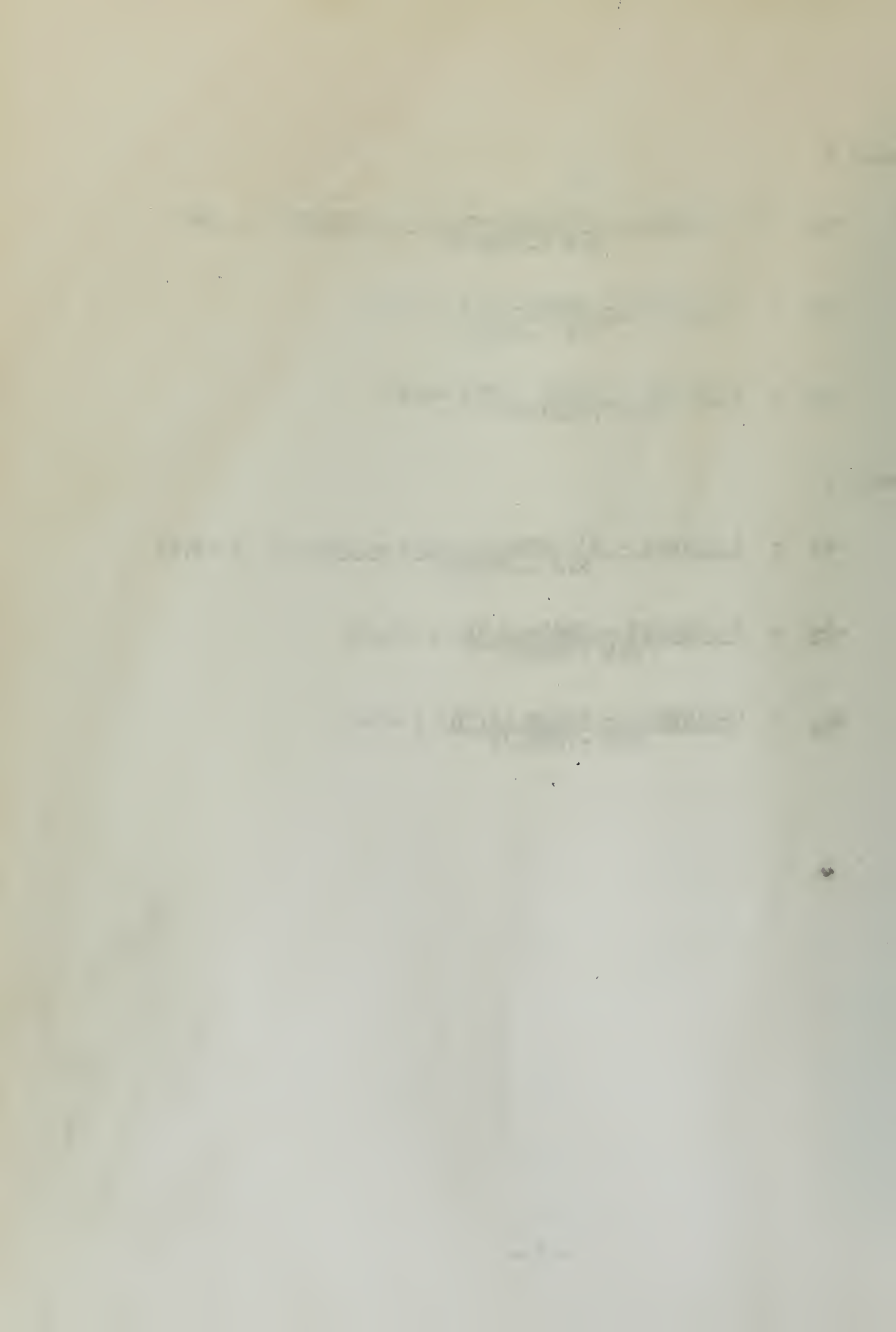
$$-Q_{R7} = \frac{(.125 \times 30 -.0443 \times -.75)}{2(2 -.0443)^5} = -0.29$$

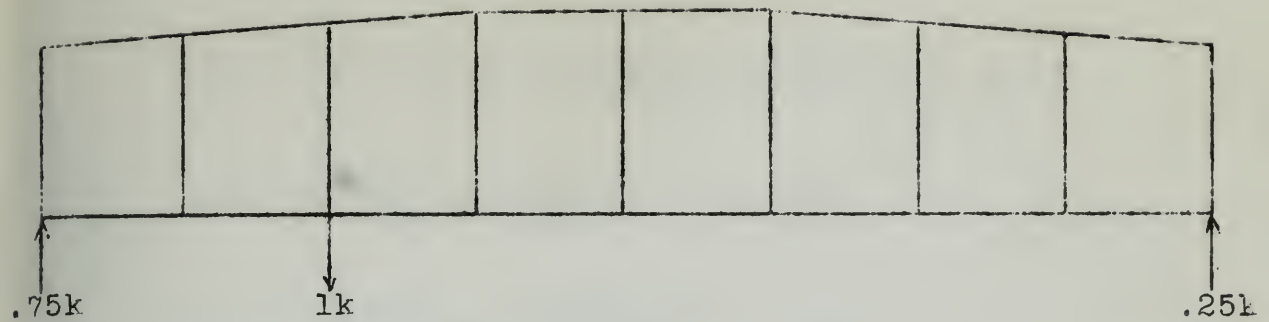
Panel 8

$$-Q_I = \frac{(.0942 \times 4 - 2)(.0861 \times -3.75 - -.125 \times 30)}{2(2 -.0861)^2} = -0.73$$

$$-Q_H = \frac{(-.125 \times 30 -.0861 \times -3.75)}{2(2 -.0861)} = -0.90$$

$$Q_{R8} = \frac{(-.125 \times 30 -.0861 \times -3.75)}{2(2 -.0861)^2} = -0.45$$





.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.75	.75	.25	-.25	-.25	-.25	-.25	-.25
22.5	45.0	37.5	30.0	-30.0	22.5	-15.0	-7.50

Panel 1

$$-Q_A = \frac{(.0942 \times 4 - 2)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)2} = 4.56$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)2} = 2.69$$

Panel 2

$$-Q_B = \frac{(.0463 \times 3 - 3)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)3} = 4.98$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)3} = 1.74$$

$$x_p = \frac{1}{2} \left(x_1 + x_2 + \dots + x_n \right) = \frac{1}{2} \left(x_1 + x_2 + \dots + x_n \right) = \frac{1}{2} \left(x_1 + x_2 + \dots + x_n \right)$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 4)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)4} = -2.33$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)4} = -.59$$

Panel 4

$$-Q_D = \frac{-4(0 + .25 \times 30)}{4 \times 4} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30 - 0)}{4} = -1.87$$

$$Q_R = \frac{(-.25 \times 30 - 0)}{4 \times 4} = -.47$$

Note: The only term that changes is $(H_1 L_1 - m M_1)$ and since this is doubled when the load is at panel point 2, it is tripled when the load is at panel point 3, etc. The following constants are derived by multiplying those obtained when the load was at PPl by the factors 2, 3, & 4.

Panel 5

$$-Q_L = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -.47$$

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Panel 6

$$-Q_G = -1.60$$

$$-Q_F = -1.64$$

$$Q_{R6} = -.41$$

Panel 7

$$-Q_H = -1.67$$

$$-Q_G = -1.75$$

$$Q_{R7} = -0.58$$

Panel 8

$$-Q_I = -1.45$$

$$-Q_H = -1.79$$

$$Q_{R8} = -0.90$$

Load at PP3

Panel 5

$$-Q_E = -2.81$$

$$-Q_F = -2.81$$

$$Q_{R5} = -0.70$$

Panel 6

$$-Q_F = -2.47$$

$$-Q_G = -2.40$$

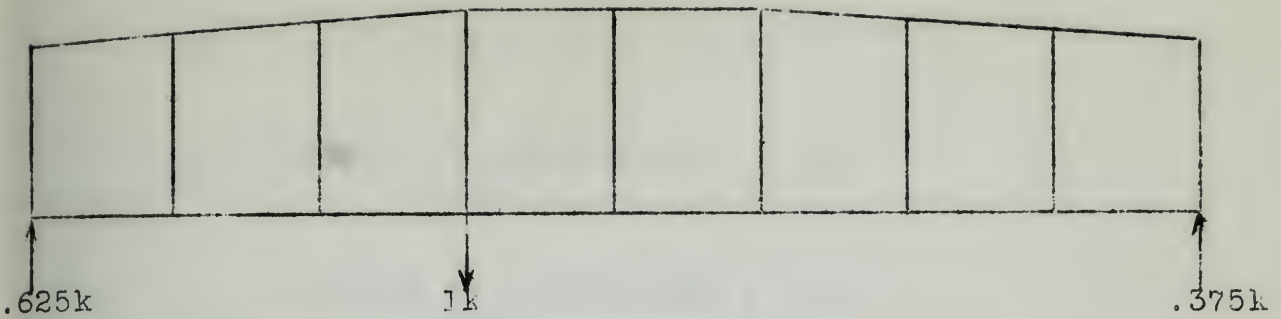
$$Q_{R6} = -0.62$$

Panel 7

$$-Q_G = -2.62$$

$$-Q_H = -2.50$$

$$Q_{R7} = -0.87$$



.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.625	.625	.625	-.375	-.375	-.375	-.375	-.375
18.75	37.5	56.25	45.0	-45.0	-33.75	-22.5	-11.25

Panel 1

Formulae (110f)&(122a) modified by the application of constants for terms involving only M, n, K₁, and K₂. These constants found and checked in solution for two previous loadings.

$$-Q_A = (-.222)(.0866 \times 18.75 - .625 \times 30) = 3.81$$

$$-Q_B = \frac{(.625 \times 30 - .0866 \times 18.75)}{3.82} = 4.49$$

$$Q_{R1} = \frac{(.625 \times 30 - .0482 \times 56.25)}{7.64} = 2.24$$

Panel 2

$$-Q_B = (-.243)(.0443 \times 37.5 - .625 \times 30) = 4.16$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{3.92} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{11.77} = 1.48$$

...the ...

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Panel 3

$$-Q_C = (-.25)(.0482 \times 56.25 - .625 \times 30) = 4.02$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{(3.90)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{15.60} = 1.03$$

Panel 4

$$-Q_D = (-.25)(0 - .375 \times 30) = -2.81$$

$$-Q_E = \frac{(-.375 \times 30 - 0)}{4} = -2.81$$

$$Q_{R4} = \frac{(-.375 \times 30 - 0)}{4 \times 4} = -.70$$

Panel 5

$$-Q_E = -3.75$$

$$-Q_F = -3.75$$

$$Q_{R5} = -0.938$$

Panel 6

$$-Q_F = -3.288$$

$$-Q_G = -3.204$$

$$Q_{R6} = -0.82$$

Panel 7

$$-Q_G = -3.496$$

$$-Q_H = -3.332$$

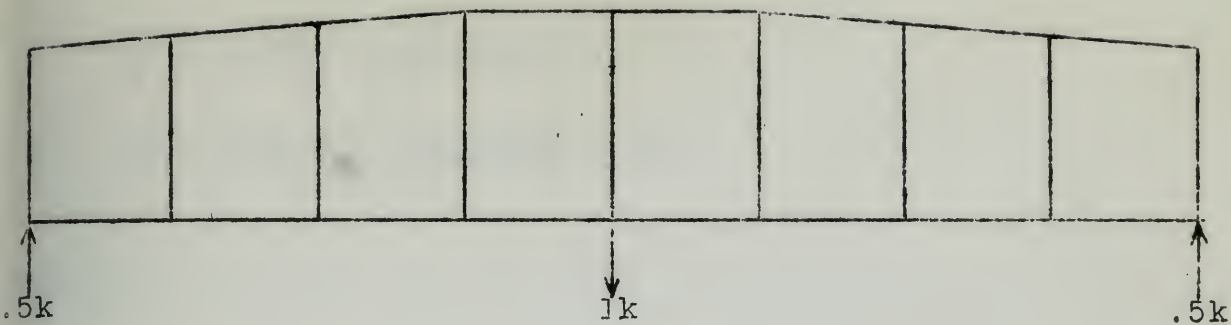
$$Q_{R7} = -1.164$$

Panel 8

$$-Q_H = -3.584$$

$$-Q_I = -2.908$$

$$Q_{R8} = -1.792$$



.0866	.0482	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.5	.5	.5	.5	-.5	-.5	-.5	-.5
15	30	45	60	-60	-45	-30	-15

Panel 1

$$-Q_A = (-.222)(.0866 \times 15 - .5 \times 30) = 3.04$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{3.82} = 3.59$$

$$Q_{R1} = \frac{(.5 \times 30 - .0866 \times 15)}{7.64} = 1.79$$

Panel 2

$$-Q_B = (-.243)(.0443 \times 30 - .5 \times 30) = 3.32$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{3.92} = 3.49$$

$$Q_{R2} = \frac{(.5 \times 30 - .0443 \times 30)}{11.76} = 1.16$$

Panel 3

$$-Q_C = (-.25)(.0482 \times 45 - .5 \times 30) = 3.21$$

$$-Q_D = \left(\frac{.5 \times 30 - .0482 \times 45}{3.90} \right) = 3.30$$

$$Q_{R3} = \left(\frac{.5 \times 30 - .0482 \times 45}{15.60} \right) = .82$$

Panel 4

$$-Q_D = (-.25)(0 - .5 \times 30) = 3.75$$

$$-Q_E = \left(\frac{.5 \times 30 - 0}{4} \right) = 3.75$$

$$Q_{R4} = \left(\frac{.5 \times 30 - 0}{4 \times 4} \right) = .94$$

Panel 5

$$-Q_E = -2.31$$

$$-Q_F = -2.81$$

$$Q_{R5} = -0.70$$

Panel 6

$$-Q_F = -2.47$$

$$-Q_G = -2.40$$

$$Q_{R6} = -0.62$$

Panel 7

$$-Q_G = -2.62$$

$$-Q_H = -2.50$$

$$Q_{R7} = -0.87$$

Panel 8

$$-Q_H = -2.18$$

$$-Q_I = -2.67$$

$$Q_{R8} = -1.34$$

1. The first part of the paper is devoted to a general discussion of the problem.

2. In the second part, we consider the case of a single particle.

3. The third part is devoted to the case of a system of particles.

4. In the fourth part, we consider the case of a continuous medium.

5. The fifth part is devoted to the case of a system of continuous media.

6. In the sixth part, we consider the case of a system of particles and continuous media.

7. The seventh part is devoted to the case of a system of particles and continuous media.

8. In the eighth part, we consider the case of a system of particles and continuous media.

9. The ninth part is devoted to the case of a system of particles and continuous media.

10. In the tenth part, we consider the case of a system of particles and continuous media.

11. The eleventh part is devoted to the case of a system of particles and continuous media.

12. In the twelfth part, we consider the case of a system of particles and continuous media.

13. The thirteenth part is devoted to the case of a system of particles and continuous media.

14. In the fourteenth part, we consider the case of a system of particles and continuous media.

15. The fifteenth part is devoted to the case of a system of particles and continuous media.

INFLUENCE LINES - JOINT CONSTANTS

LOAD AT B

Panel 1

$$\left[1.5x_4 + 2 + \frac{(3 - .0866)(.0942x_4 - 2)}{2(2 - .0866)} \right] A + \left[1 + \frac{(3 - .17)(.0942x_4 - 2)}{2(2 - .0866)} \right] B = -Q$$

$$6.77A - .25B = 5.32$$

$$\left[2 + 1.5 \times 3 - \frac{(3 - .17)2}{2(2 - .0866)} \right] B + \left[\frac{2}{3} - \frac{(3 - .0866)2}{2(2 - .0866)} \right] A = -Q_B$$

$$5.02B - .52A = 6.27$$

Solving Simultaneously

$$A = 0.82$$

$$B = 1.33$$

$$R_1 = \frac{(3 - .0866) .82 + (3 - .17)1.33 + 3.14}{2(2 - .0866)} = 4.76$$

Panel 2

$$\left[1.5x_3 + 3 + \frac{(3 - .0443)(.0463x_3 - 3)}{2(2 - .0443)} \right] B + \left[\frac{3}{2} + \frac{(3 - .09)(.0463x_3 - 3)}{2(2 - .0443)} \right] C = -Q_B$$

$$5.34B - .62C = -1.16$$

$$\left[3 + 1.5x_2 - \frac{(3 - .0886)3}{2(2 - .0443)} \right] C + \left[\frac{3}{2} - \frac{(3 - .0443)3}{2(2 - .0443)} \right] B = -Q_C$$

$$3.77C - .76B = -1.21$$

Solving Simultaneously

$$B = -.26$$

$$C = -.37$$

$$R_2 = \frac{(3 - .0443)(-.26) + (3 - .09)(-.37) - .40}{2(2 - .0443)} = -.87$$

Panel 3

$$\left[1.5x2 + 4 + \frac{(3 - .0482)(.0507x2 - 4)}{2(2 - .0482)} \right] C + \left[2 + \frac{(3 - .0964)(.0507x2 - 4)}{2(2 - .0482)} \right] D = -Q_C$$

$$4.05 C - .9 D = -1.16$$

$$\left[4 + 1.5 - \frac{(3 - .0964)4}{2(2 - .0482)} \right] D + \left[2 - \frac{(3 - .0482)4}{2(2 - .0482)} \right] C = -Q_D$$

$$2.53 D - 1.02 C = 1.19$$

Solving Simultaneously

$$\begin{aligned} C &= -.43 \\ D &= -.64 \end{aligned}$$

$$R_3 = \frac{(3 - .0482)(-.43) + (3 - .0964)(-.64)}{2(2 - .0482)} - .30 = -1.10$$

Panel 4

$$\left[1.5x1 + 4 + \frac{3(-4)}{4} \right] D + \left[2 + \frac{3(-4)}{4} \right] E = -Q_D$$

$$2.5 D - 1 E = -.94$$

$$\left[4 + 1.5x1 - \frac{3x4}{4} \right] E + \left[2 - \frac{3x4}{4} \right] D = -Q_E$$

$$2.5 E - 1 D = -.94$$

Solving Simultaneously

$$\begin{aligned} D &= -.63 \\ E &= -.63 \end{aligned}$$

$$R_4 = \frac{3(-.63) + 3(-.63)}{4} - .23 = -1.18$$

Panel 5

$$\left[1.5 \times 1 + \frac{4}{4} \right] F - \frac{4}{4} E = -.94$$

$$\left[1.5 \times 1 + \frac{4}{4} \right] E - \frac{4}{4} F = -.94$$

$$E = -.63$$

$$F = -.63$$

$$R_5 = \frac{3}{4} (-.63 - .63) - .23 = -.94 - .23 = -1.17$$

Panel 6

$$\left[1.5 \times 2 + 4 + \frac{(3 - .0482)(.0507 \times 2 - 4)}{2(2 - .0482)} \right] G$$

$$+ \left[\frac{4}{2} + \frac{(3 - 2 \times .0482)(.0507 \times 2 - 4)}{2(2 - .0482)} \right] F = -.80$$

$$4.06 G - 0.89 F = -.80$$

$$\left[4 + 1.5 \times 1 - \frac{(3 - 2 \times .0482)4}{2(2 - .0482)} \right] F + \left[\frac{4}{2} - \frac{(3 - .0482)4}{2(2 - .0482)} \right] G = -.82$$

$$2.53 F - 1.02 G = -.82$$

Solving Simultaneously

$$F = -.47$$

$$G = -.30$$

$$R_6 = \frac{-(3 - .0482) \times .30 - (3 - 2 \times .0482) \times .47}{2(2 - .0482)} - .21 = -.78$$

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[Faint, illegible text]

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[Faint, illegible text]

[Faint, illegible text]

[Faint, illegible text]

[Faint, illegible text]

[Faint, illegible text]

[Faint, illegible text]

[Faint, illegible text]

Panel 7

$$\left[1.5 \times 3 + 3 + \frac{(3-.0443)(.0463 \times 3 - 3)}{2(2-.0443)} \right] H$$

$$+ \left[\frac{3}{2} + \frac{(3-2 \times .0443)(.0463 \times 3 - 3)}{2(2-.0443)} \right] G = -0.83$$

$$5.34 H - .62 G = -.83$$

$$\left[3 + 1.5 \times 2 - \frac{(3-2 \times .0443)3}{2(2-.0443)} \right] G + \left[\frac{3}{2} - \frac{(3-.0433)3}{2(2-.0433)} \right] H = -.87$$

$$3.77 G - .76 H = -.87$$

Solving Simultaneously

$$G = -.27$$

$$H = -.19$$

$$R_7 = - \frac{(3-.0443) \times .19 + (3-2 \times .0443) \times -.27}{2(2-.0443)} - 0.29 = -.63$$

Panel 8

$$\left[1.5 \times 4 + 2 + \frac{(3-.0866)(.0942 \times 4 - 2)}{2(2-.0866)} \right] I + \left[\frac{2}{2} + \frac{(3-2 \times .0866)(.0942 \times 4 - 2)}{2(2-.0866)} \right] H$$

$$= -.73$$

$$6.77 I - .20 H = -.73$$

$$\left[2 + 1.5 \times 3 - \frac{(3-2 \times .0866)2}{2(2-.0866)} \right] H + \left[\frac{2}{2} - \frac{(3-.0866)2}{2(2-.0866)} \right] I$$

$$5.02 H - .52 I = -.49$$

Solving Simultaneously

$$H = -0.21$$

$$I = -0.11$$

$$R_8 = - \frac{(3-.0866) \times .11 - (3-2 \times .0866) \times -.21}{2(2-.0861)} - 0.49 = .73$$

1. The first part of the paper is devoted to the study of the properties of the function $f(x)$ defined by the equation

$$f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right)$$

where $f(x)$ is a function defined on the interval $[0, 1]$.

It is easy to see that the function $f(x)$ is continuous on the interval $[0, 1]$ and that it satisfies the functional equation

$$f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right)$$

for all $x \in [0, 1]$.

$$\text{We can show that } f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right) \text{ for all } x \in [0, 1].$$

Let us assume that $f(x)$ is a function defined on the interval $[0, 1]$ and that it satisfies the functional equation

$$f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right)$$

for all $x \in [0, 1]$.

$$\text{We can show that } f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right) \text{ for all } x \in [0, 1].$$

Let us assume that $f(x)$ is a function defined on the interval $[0, 1]$ and that it satisfies the functional equation

$$f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right) \text{ for all } x \in [0, 1].$$

for all $x \in [0, 1]$.

Let us assume that $f(x)$ is a function defined on the interval $[0, 1]$ and that it satisfies the functional equation

$$f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right) \text{ for all } x \in [0, 1].$$

for all $x \in [0, 1]$.

Let us assume that $f(x)$ is a function defined on the interval $[0, 1]$ and that it satisfies the functional equation

$$f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right)$$

for all $x \in [0, 1]$.

$$\text{We can show that } f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right) \text{ for all } x \in [0, 1].$$

Influence Lines - Joint Constants

Load at C

Panel 1

$$6.77A - .2 B = 4.56$$

$$-.52A + 5.02B = 5.38$$

Solving Simultaneously

$$A = .71$$

$$B = 1.14$$

$$R_1 = \frac{(3 - .0866) \cdot .71 + (3 - .17) 1.14}{2(2 - .0866)} + 2.69 = 4.07$$

Panel 2

$$5.34B - .62C = 4.98$$

$$3.77C - .76B = 5.23$$

Solving Simultaneously

$$B = 1.14$$

$$C = 1.62$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0886)C}{2(2 - .0443)} + 1.76 = 3.80$$

Panel 3

$$4.05C - .9 D = -2.23$$

$$2.53D - 1.02C = -1.19$$

Solving Simultaneously

$$C = -.72$$

$$D = -.76$$

$$R_3 = \frac{(3 - .0482)(-.72) + (3 - .0964)(-.76)}{2(2 - .0482)} - .59 = -1.70$$

Panel 4

$$2.5D - 1E = -1.87$$

$$2.5E - 1D = -1.87$$

Solving Simultaneously

$$D = -1.25$$

$$E = -1.25$$

$$R_4 = \frac{3(-1.25) + 3(-1.25)}{4} - .47 = -2.34$$

Panel 5

$$E = -1.25$$

$$F = -1.25$$

$$R_5 = -2.34$$

Panel 6

$$F = -0.94$$

$$G = -0.60$$

$$R_6 = -1.56$$

Panel 7

$$G = -0.54$$

$$H = -0.37$$

$$R_7 = -1.27$$

Panel 8

$$H = -0.41$$

$$I = -0.23$$

$$R_8 = -1.45$$

Influence Lines - Joint Constants

Load at D

Panel 1

$$6.77A - .2 B = 3.81$$

$$-.52A + 5.02B = 4.49$$

Solving Simultaneously

$$A = .59$$

$$B = .96$$

$$R_1 = \frac{(3 - .0866) .59 + (3 - .17) .96}{2(2 - .0866)} + 2.24 = 3.40$$

Panel 2

$$5.34B - .62C = 4.16$$

$$3.77C - .76B = 4.36$$

Solving Simultaneously

$$B = .94$$

$$C = 1.34$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0886)C}{2(2 - .0443)} + 1.48 = 3.18$$

Panel 3

$$4.05C - .9D = 4.02$$

$$2.53D - 1.02C = 4.12$$

Solving Simultaneously

$$C = 1.49$$

$$D = 2.23$$

$$R_3 = \frac{(3 - .0482)1.49 + (3 - .0964)2.23}{2(2 - .0482)} + 1.03 = 3.81$$

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Panel 4

$$2.5D - 1E = -2.81$$

$$2.5E - 1D = -2.81$$

Solving Simultaneously

$$D = -1.87$$

$$E = -1.87$$

$$R_4 = \frac{3(-1.87) + 3(-1.87)}{4} + .70 = -3.51$$

Panel 5

$$E = -1.88$$

$$F = -1.88$$

$$R_5 = -3.52$$

Panel 6

$$F = -1.41$$

$$G = -0.90$$

$$R_6 = -2.34$$

Panel 7

$$G = -0.81$$

$$H = -0.56$$

$$R_7 = -1.90$$

Panel 8

$$H = -0.62$$

$$I = -0.34$$

$$R_8 = -2.18$$

Influence Lines - Joint Constants

Load at E

Panel 1

$$6.77A - .2B = 3.04$$

$$-.52A + 5.02B = 3.59$$

Solving Simultaneously

$$A = .47$$

$$B = .76$$

$$R_1 = \frac{(3 - .0866).47 + (3 - .17).76}{2(2 - .0866)} + 1.79 = 2.71$$

Panel 2

$$5.34B - .62C = 3.32$$

$$3.77C - .76B = 3.49$$

Solving Simultaneously

$$B = .75$$

$$C = 1.08$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0866)C}{2(2 - .0433)} + 1.16 = 2.53$$

Panel 3

$$4.05C - .9D = 3.21$$

$$2.53D - 1.02C = 3.30$$

Solving Simultaneously

$$C = 1.19$$

$$D = 1.78$$

$$R_3 = \frac{(3 - .0482)1.19 + (3 - .0964)1.78}{2(2 - .0482)} + .82 = 3.04$$

Panel 4

$$2.5D - 1E = 3.75$$

$$2.5E - 1D = 3.75$$

Solving Simultaneously

$$D = 2.5$$

$$E = 2.5$$

$$R_4 = \frac{3(2.5) + 3(2.5)}{4} + .94 = 4.69$$

Panel 5

$$E = -2.50$$

$$F = -2.50$$

$$R_5 = -4.69$$

Panel 6

$$F = -1.88$$

$$G = -1.20$$

$$R_6 = -3.12$$

Panel 7

$$G = -1.08$$

$$H = -.75$$

$$R_7 = 2.53$$

Panel 8

$$H = -.83$$

$$I = -.45$$

$$R_8 = -2.91$$

1. The first part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters α and β .

2. In the second part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

3. In the third part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

4. In the fourth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

5. In the fifth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

6. In the sixth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

7. In the seventh part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

8. In the eighth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

9. In the ninth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

10. In the tenth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

11. In the eleventh part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

12. In the twelfth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

13. In the thirteenth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

14. In the fourteenth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

15. In the fifteenth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

16. In the sixteenth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

17. In the seventeenth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

18. In the eighteenth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

19. In the nineteenth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

20. In the twentieth part we consider the case of the system of equations (1) for arbitrary values of the parameters α and β .

Influence Lines - Moment Determination

Load at B

Panel 1

$$M_{AB} = 2\left(.82 + \frac{1.33}{2} - 4.76\right) = -6.56$$

$$M_{BA} = 2\left(1.33 + \frac{.82}{2} - 4.76\right) = -6.04$$

Panel 2

$$M_{BC} = 3\left(-.26 - \frac{.37}{2} + .87\right) = +1.29$$

$$M_{CB} = 3\left(-.37 - \frac{.26}{2} + .87\right) = +1.11$$

Panel 3

$$M_{CD} = 4\left(-.43 - \frac{.64}{2} + 1.10\right) = +1.40$$

$$M_{DC} = 4\left(-.64 - \frac{.43}{2} + 1.10\right) = +1.10$$

Panel 4

$$M_{DE} = 4\left(-.63 - \frac{.63}{2} + 1.18\right) = +.96$$

$$M_{ED} = 4\left(-.63 - \frac{.63}{2} + 1.18\right) = +.96$$

Panel 5

$$M_{EF} = 4\left(-.63 - \frac{.63}{2} + 1.17\right) = +0.94$$

$$M_{FE} = 4\left(-.63 - \frac{.63}{2} + 1.17\right) = +0.94$$

Panel 6

$$M_{FG} = 4(-.47 - \frac{.30}{2} + .78) = +0.64$$

$$M_{GF} = 4(-.30 - \frac{.47}{2} + .78) = +0.98$$

Panel 7

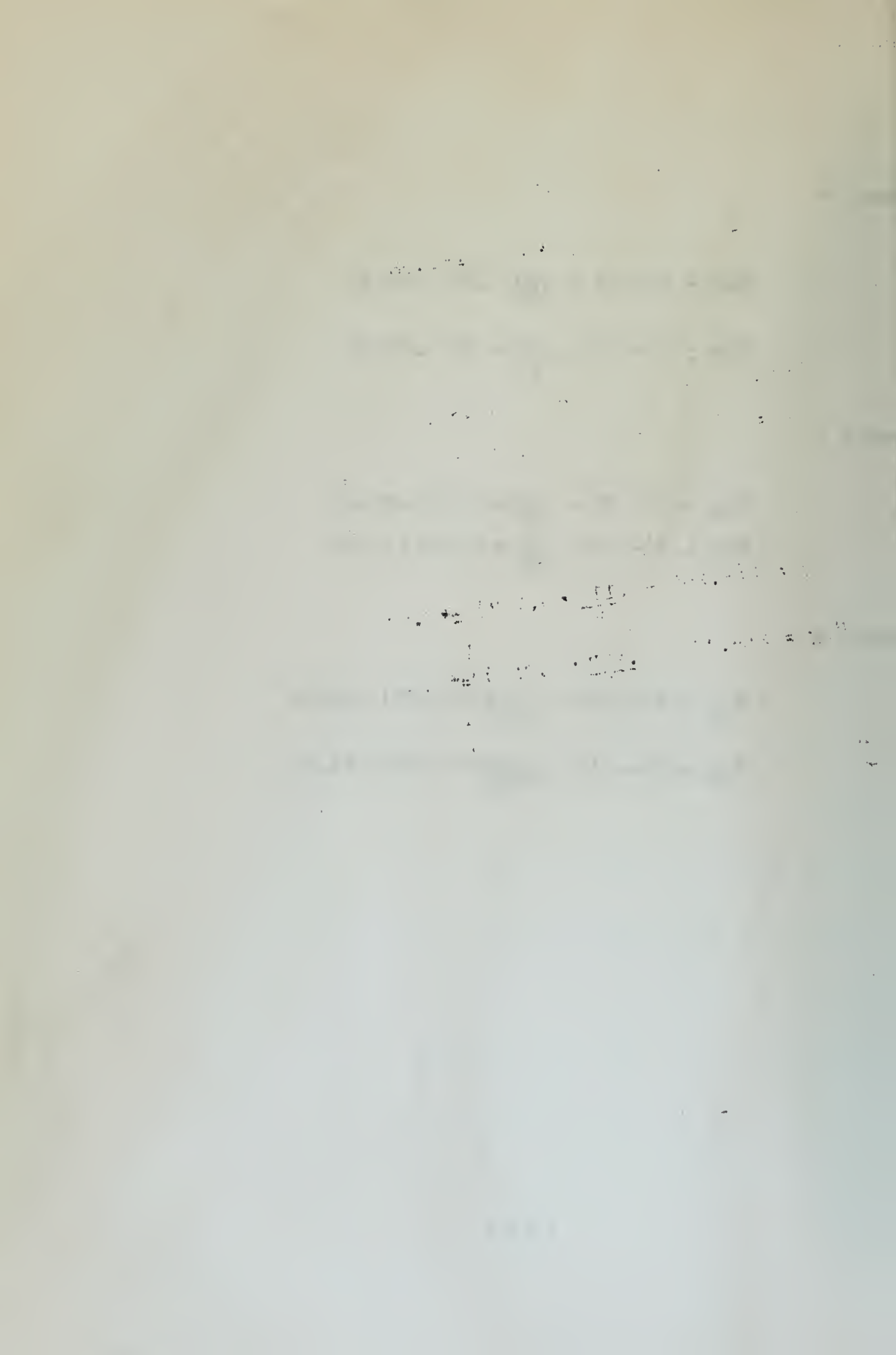
$$M_{GH} = 3(-.27 - \frac{.19}{2} + 0.63) = +0.81$$

$$M_{HG} = 3(-.19 - \frac{.27}{2} + 0.63) = +0.93$$

Panel 8

$$M_{HI} = 2(-.207 - \frac{.113}{2} + 0.727) = +0.93$$

$$M_{IH} = 2(-.113 - \frac{.207}{2} + 0.727) = +1.02$$



Influence Lines - Moment Determination

Load at C

Panel 1

$$M_{AB} = 2\left(.71 + \frac{1.14}{2} - 4.07\right) = -5.58$$

$$M_{BA} = 2\left(1.14 + \frac{.71}{2} - 4.07\right) = -5.16$$

Panel 2

$$M_{BC} = 3\left(1.14 + \frac{1.62}{2} - 3.80\right) = -5.55$$

$$M_{CB} = 3\left(1.62 + \frac{1.14}{2} - 3.80\right) = -4.83$$

Panel 3

$$M_{CD} = 4\left(-.72 - \frac{.76}{2} + 1.70\right) = +2.40$$

$$M_{DC} = 4\left(-.76 - \frac{.72}{2} + 1.70\right) = +2.32$$

Panel 4

$$M_{DE} = 4\left(-1.25 - \frac{1.25}{2} + 2.34\right) = +1.88$$

$$M_{ED} = 4\left(-1.25 - \frac{1.25}{2} + 2.34\right) = +1.88$$

Panel 5

$$M_{EF} = 1.88$$

$$M_{FE} = 1.88$$

Panel 6

$$M_{FG} = 1.29$$

$$M_{GF} = 1.96$$

Panel 7

$$M_{GH} = 1.62$$

$$M_{HG} = 1.87$$

Panel 8

$$M_{HI} = 1.85$$

$$M_{IH} = 2.04$$

Influence Lines - Moment Determination

Load at D

Panel 1

$$M_{AB} = 2(.59 + \frac{.96}{2} - 3.40) = -4.66$$

$$M_{BA} = 2(.96 + \frac{.59}{2} - 3.40) = -4.30$$

Panel 2

$$M_{BC} = 3(.94 + \frac{1.34}{2} - 3.18) = -4.71$$

$$M_{CB} = 3(1.34 + \frac{.94}{2} - 3.18) = -4.11$$

Panel 3

$$M_{CD} = 4(1.49 + \frac{2.23}{2} - 3.81) = -4.84$$

$$M_{DC} = 4(2.23 + \frac{1.49}{2} - 3.81) = -3.36$$

Panel 4

$$M_{DE} = 4(-1.87 - \frac{1.87}{2} + 3.51) = +2.84$$

$$M_{ED} = 4(-1.87 - \frac{1.87}{2} + 3.51) = +2.84$$

Panel 5

$$M_{EF} = 2.81$$

$$M_{FE} = 2.81$$

Panel 6

$$M_{FG} = 1.93$$

$$M_{GF} = 2.94$$

Panel 7

$$M_{GH} = 2.43$$

$$M_{HG} = 2.80$$

Panel 8

$$M_{HI} = 2.78$$

$$M_{IH} = 3.06$$

PHYSICS 101

LECTURE 1

MECHANICS

1.1

INTRODUCTION

1.2

1.3

1.4

1.5

1.6

1.7

1.8

1.9

1.10

1.11

1.12

1.13

1.14

1.15

1.16

1.17

1.18

Influence Lines - Moment Determination

Load at E

Panel 1

$$M_{AB} = 2(.47 + \frac{.76}{2} - 2.79) = -3.88$$

$$M_{BA} = 2(.76 + \frac{.47}{2} - 2.79) = -3.60$$

Panel 2

$$M_{BC} = 3(.75 + \frac{1.08}{2} - 2.53) = -3.72$$

$$M_{CB} = 3(1.08 + \frac{.75}{2} - 2.53) = -3.24$$

Panel 3

$$M_{CD} = 4(1.19 + \frac{1.78}{2} - 3.04) = -3.84$$

$$M_{DC} = 4(1.78 + \frac{1.19}{2} - 3.04) = -2.68$$

Panel 4

$$M_{DE} = 4(2.5 + \frac{2.5}{2} - 4.69) = -3.76$$

$$M_{ED} = 4(2.5 + \frac{2.5}{2} - 4.69) = -3.76$$

Panel 5

$$M_{EF} = 3.75$$

$$M_{FE} = 3.75$$

Panel 6

$$M_{FG} = 2.58$$

$$M_{GF} = 3.92$$

Panel 7

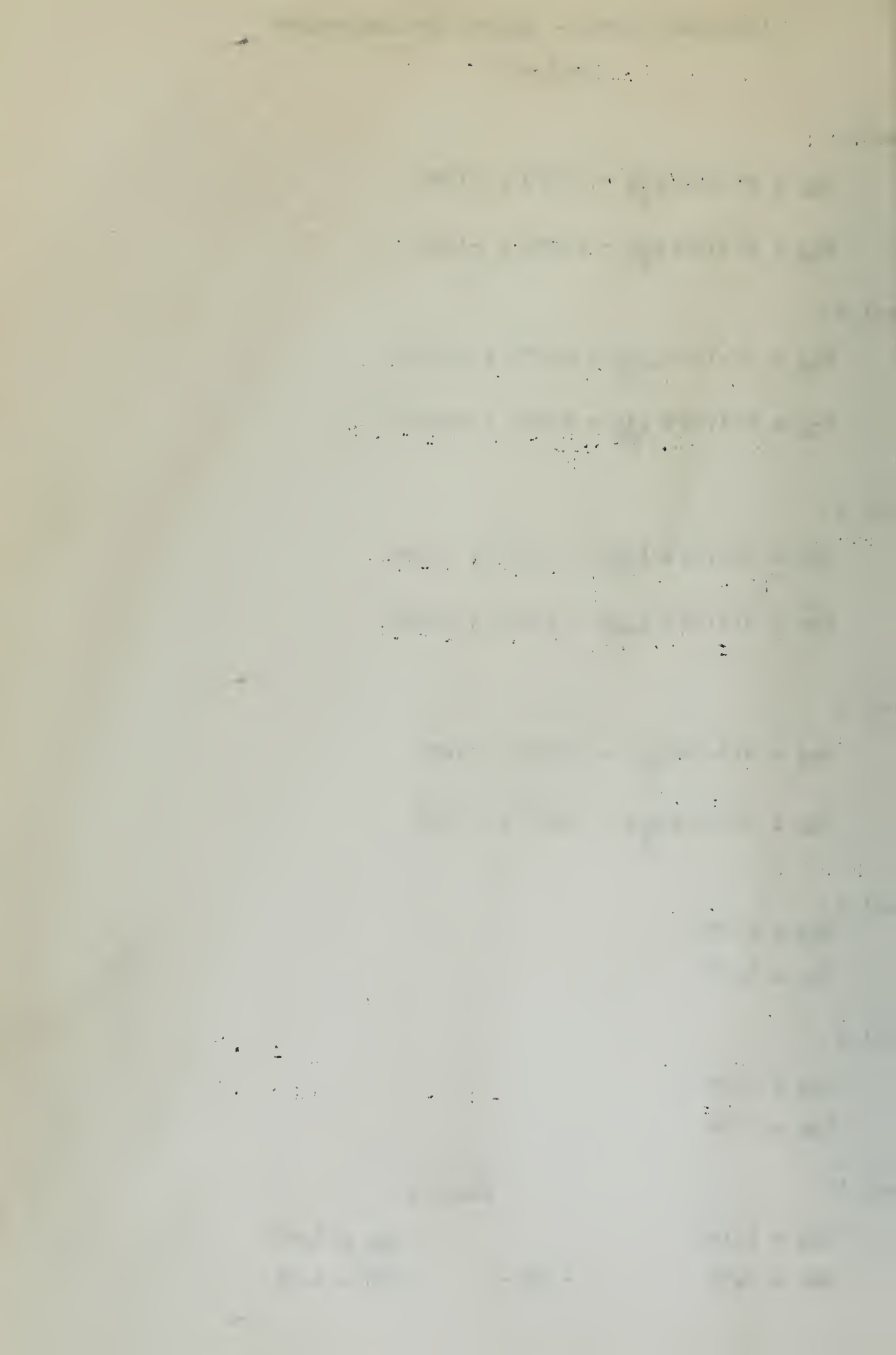
$$M_{GH} = 3.24$$

$$M_{HG} = 3.73$$

Panel 8

$$M_{HI} = 3.60$$

$$M_{IH} = 4.08$$



First Moment Corrections - Load at B

Panel 1

$$6.77A - .20B = 0 \quad A = -.01$$

$$-0.52A + 5.02B = -1.29 \quad B = -.25$$

$$R_1 = \frac{-2.91 \times .01 - 2.83 \times .25}{3.83} = -.19$$

$$M_{AB} = 2(-.01 - \frac{.25}{2} + .19) = .12$$

$$M_{BA} = 2(-.25 - \frac{.01}{2} + .19) = -.12$$

Panel 2

$$5.34B - .63C = 6.04 \quad B = 1.11$$

$$-0.77B + 3.77C = -1.40 \quad C = -0.14$$

$$R_2 = \frac{2.96 \times 1.11 - 2.91 \times .14}{3.91} = .74$$

$$M_{BC} = 2(1.11 - \frac{.14}{2} + 0.74) = .60$$

$$M_{CB} = 2(-.14 + \frac{1.11}{2} + 0.74) = -.64$$

Panel 3

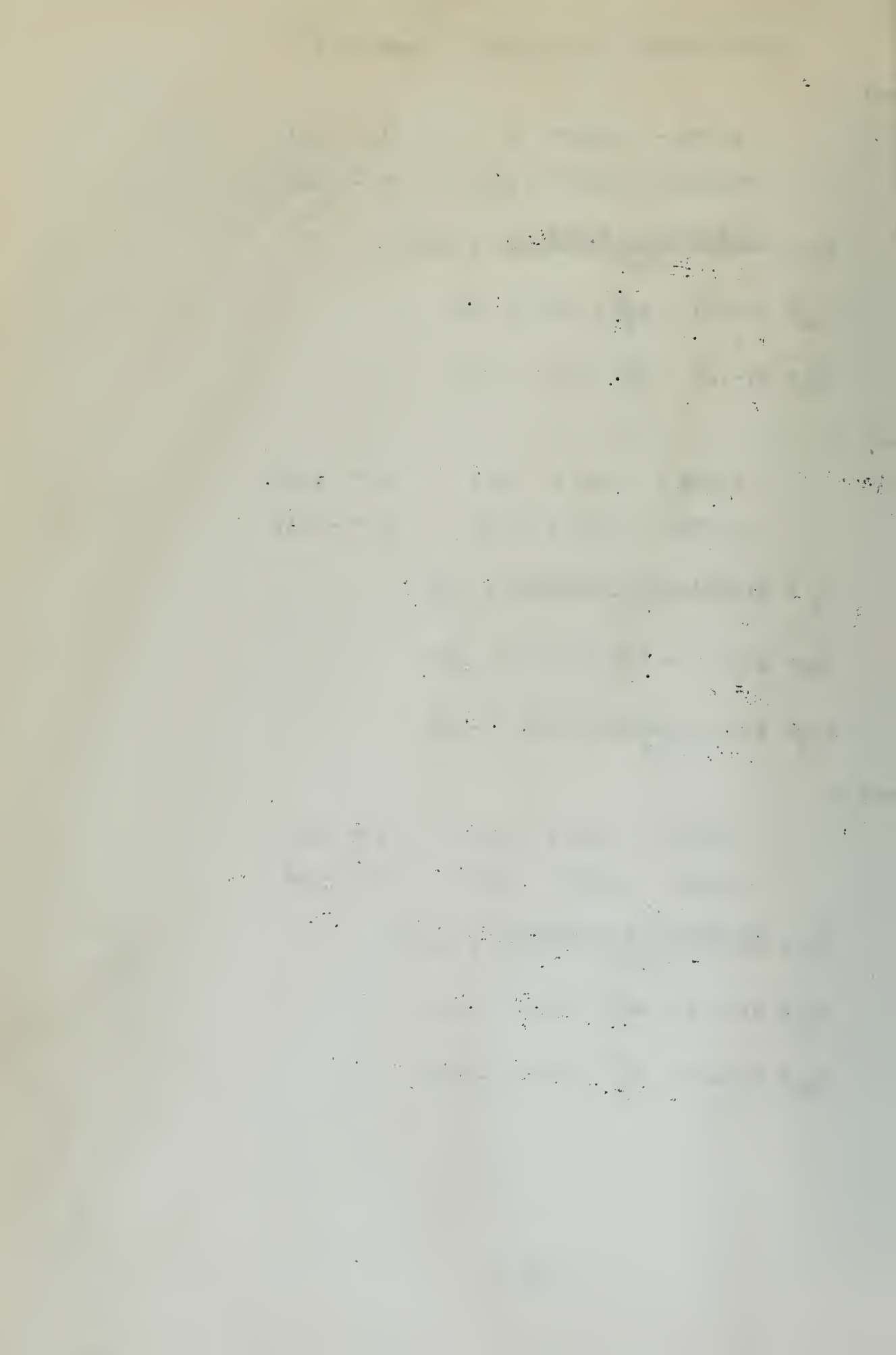
$$4.06C - .89D = -1.11 \quad C = -.39$$

$$-1.02C + 2.53D = -.96 \quad D = -.54$$

$$R_3 = \frac{-2.95 \times .39 - 2.90 \times .54}{3.90} = -.70$$

$$M_{CD} = 3(-.39 - \frac{.54}{2} + .70) = .12$$

$$M_{DC} = 3(-.54 - \frac{.39}{2} + .70) = -.12$$



Panel 4

$$\begin{aligned} 2.5 D - E &= -1.10 \\ -0 + 2.5 E &= -.96 \\ D &= -.71 \\ E &= -.67 \end{aligned}$$

$$R_4 = \frac{3}{4} (-.67 - .71) = -1.03$$

$$M_{DE} = 4(-.71 - \frac{.67}{2} + 1.03) = -.08$$

$$M_{ED} = 4(-.67 - \frac{.71}{2} + 1.03) = .04$$

Panel 5

$$\begin{aligned} 2.5 E - F &= -.64 \\ -E + 2.5 F &= -.96 \\ E &= -.49 \\ F &= -.58 \end{aligned}$$

$$R_5 = \frac{3}{4} (-.58 - .49) = -.80$$

$$M_{EF} = 4(-.49 - \frac{.58}{2} + .80) = .08$$

$$M_{FE} = 4(-.58 - \frac{.49}{2} + .80) = -.12$$

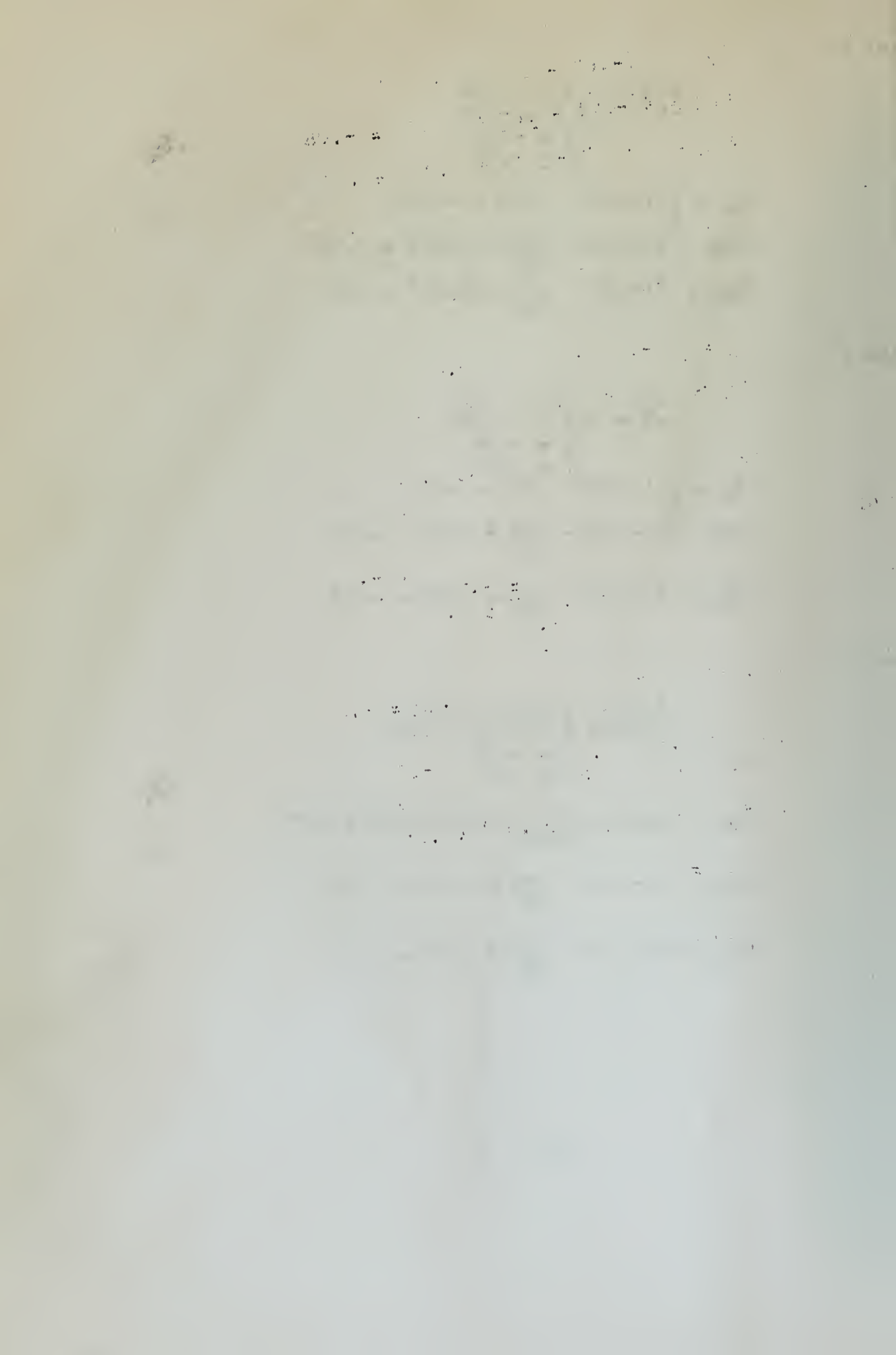
Panel 6

$$\begin{aligned} 4.06 - 0.89 F &= -.81 \\ -1.026 + 2.53 F &= -.96 \\ F &= -.50 \\ G &= -.31 \end{aligned}$$

$$R_6 = \frac{-2.95 \times .31 - 2.90 \times .50}{3.90} = -.61$$

$$M_{FG} = 3(-.50 - \frac{.31}{2} + .61) = -.15$$

$$M_{GF} = 3(-.31 - \frac{.50}{2} + .61) = .15$$



Panel 7

$$\begin{aligned}5.34 H - 0.63 G &= -.93 \\-0.77 H + 3.77 G &= -.98 \\G &= -.30 \\H &= -.21\end{aligned}$$

$$R_7 = \frac{-2.96 \times .21 - 2.91 \times .3}{3.91} = -.38$$

$$M_{GH} = 2(-.30 - \frac{.21}{2} + .38) = -.06$$

$$M_{HG} = 2(-.21 - \frac{.30}{2} + .38) = .06$$

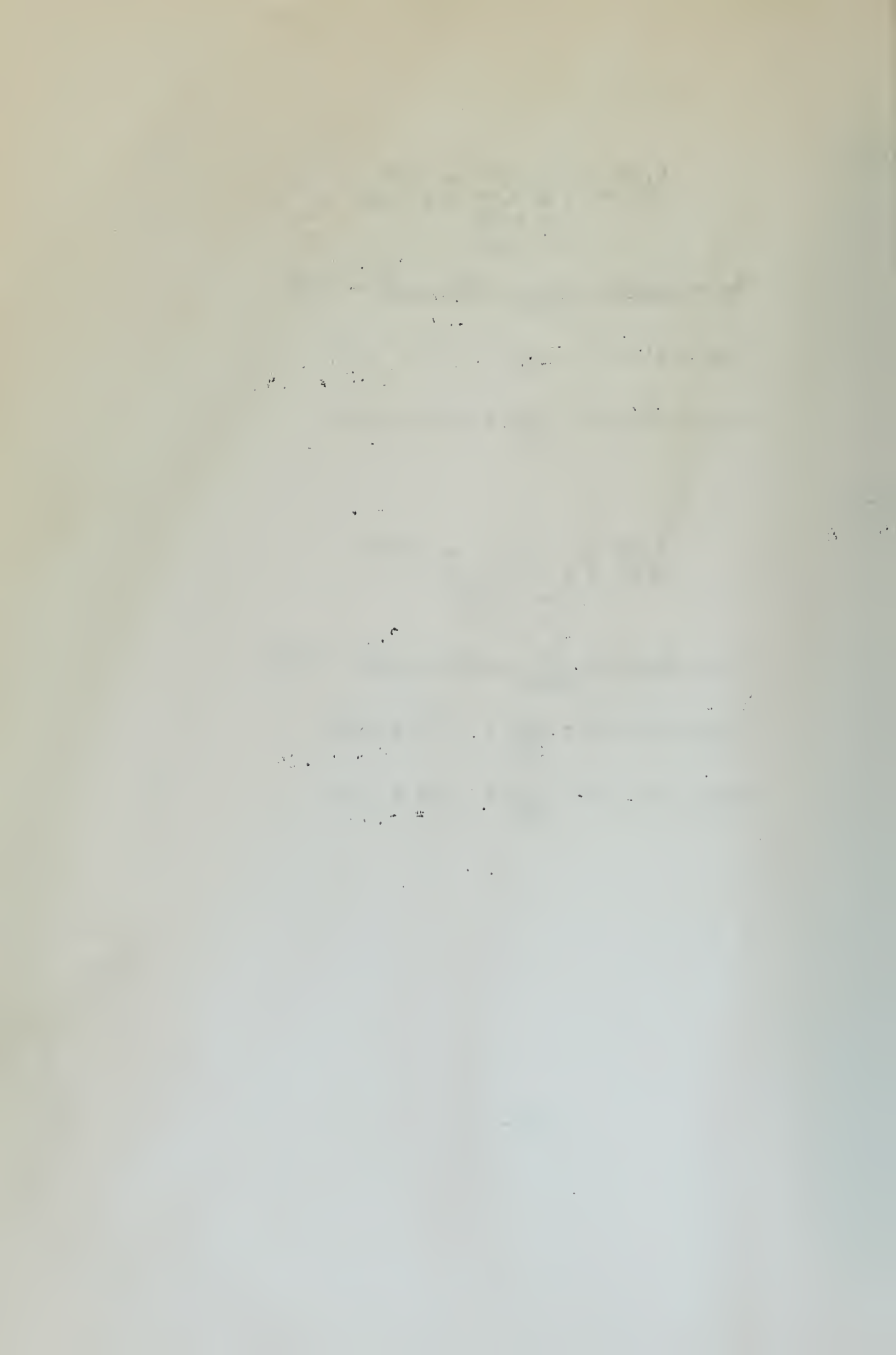
Panel 8

$$\begin{aligned}5.02 H - 0.52 I &= -.0.93 \\-0.20 H + 6.77 I &= 0 \\H &= -0.19 \\I &= -0.01\end{aligned}$$

$$R_8 = \frac{-2.91 \times .01 - 2.83 \times .19}{3.83} = -0.15$$

$$M_{HI} = 2(-.19 - \frac{.01}{2} + .15) = -.08$$

$$M_{IH} = 2(-.01 - \frac{.19}{2} + .15) = .08$$



SECOND MOMENT CORRECTIONS

Load at B

Panel 1

$$\begin{aligned} 6.77 A - 0.20 B &= 0 \\ -0.52 A + 5.02 B &= -.60 \end{aligned}$$

$$\begin{aligned} A &= 0 \\ B &= -.12 \end{aligned}$$

$$R_1 = \frac{-2.83 \times .12}{3.83} = -.09$$

$$M_{AB} = 2\left(0 - \frac{.12}{2} + .09\right) = .06$$

$$M_{BA} = 2(-.12 + .09) = -.06$$

Panel 2

$$5.34 B - 0.63 C = -.12$$

$$-0.77 B + 3.77 C = .12$$

$$B = .03$$

$$C = .04$$

$$R_2 = \frac{-2.96 \times .03 - 2.91 \times .04}{3.91} = -.05$$

$$M_{BC} = 2(-.03 - \frac{.04}{2} + .05) = 0$$

$$M_{CB} = 2(-.04 - \frac{.03}{2} + .05) = -.01$$

Load at PP1

	Panel	1		2		3		4	
		A	B	B	C	C	D	D	E
Initial Values	-Q	+5.32	+6.27	-1.16	-1.21	-1.16	-1.19	-0.94	-0.94
	∞	+1.31	+1.33	-0.26	-0.37	-0.43	-0.64	-0.63	-0.63
	R	+4.76		-0.87		-1.10		-1.18	
	M'	-6.56	-6.04	+1.29	+1.11	+1.40	+1.10	+0.96	+0.96
First Incre- ment	-Q	+0.00	-1.29	+6.04	-1.40	-1.11	-0.96	-1.10	-0.96
	∞	-0.01	-0.25	+1.11	-0.14	-0.39	-0.54	-0.71	-0.67
	R	-0.19		+0.74		-0.70		-1.03	
	M'	+0.12	-0.12	+0.60	-0.64	+ .12	- .12	- .08	+ .04
	-Q	+0.00	-0.60	-0.12	-0.12	+0.64	-0.04	+0.12	+0.12
	∞	+0.00	-0.12	-0.03	-0.04				
	R	-0.09		-0.05					
	M'	+0.06	-0.06	+0.00	-0.01	-	-	-	-
	M	-6.38	-6.22	+1.89	+0.46	+1.52	+0.98	+0.88	+1.00

	5		6		7		8	
	E	F	F	G	G	H	H	I
-Q	-0.94	-0.94	-0.82	-0.80	-0.87	-0.83	-0.90	-0.73
α	-0.63	-0.63	-0.47	-0.30	-0.27	-0.19	-0.21	-0.11
R	-1.18		-0.78		-0.63		-0.73	
M	+0.96	+0.96	+0.64	+0.98	+0.81	+0.93	+0.93	+1.02
-Q	-0.96	-0.64	-0.96	-0.81	-0.98	-0.93	-0.93	+0.00
α	-0.49	-0.58	-0.50	-0.31	-0.30	-0.21	-0.19	-0.01
R	-0.80		-0.61		-0.38		-0.15	
M'	+0.08	-0.12	-0.15	+0.15	-0.06	+0.06	-0.08	+0.08
	+0.08	+0.15	+0.12	+0.06	-0.15	+0.08	-0.06	
	-	-	-	-	-	-	-	-
	+1.04	+0.84	+0.49	+1.13	+0.75	+0.99	+0.85	+1.10

First Moment Corrections

Load at C

Panel 1

$$6.77A - 0.20B = 0$$

$$-0.52A + 5.02B = 5.55$$

$$A = .33$$

$$B = 1.11$$

$$R_1 = \frac{2.91 \times .33 + 2.83 \times 1.11}{3.33} = 1.07$$

$$M_{AB} = 2\left(.33 + \frac{1.11}{2} - 1.07\right) = -.36$$

$$M_{BA} = 2\left(1.11 + \frac{.33}{2} - 1.07\right) = .40$$

Panel 2

$$5.34B - 0.63C = 5.16$$

$$-0.77B + 3.77C = -2.40$$

$$B = .91$$

$$C = -.45$$

$$R_2 = \frac{2.96 \times .91 - 2.91 \times .45}{3.91} = .35$$

$$M_{BC} = 2\left(.91 - \frac{.45}{2} - .35\right) = 1.02$$

$$M_{CB} = 2\left(-.45 + \frac{.91}{2} - .35\right) = -1.05$$

Panel 3

$$4.06C - 0.89D = 4.83$$

$$-1.02C + 2.53D = -1.88$$

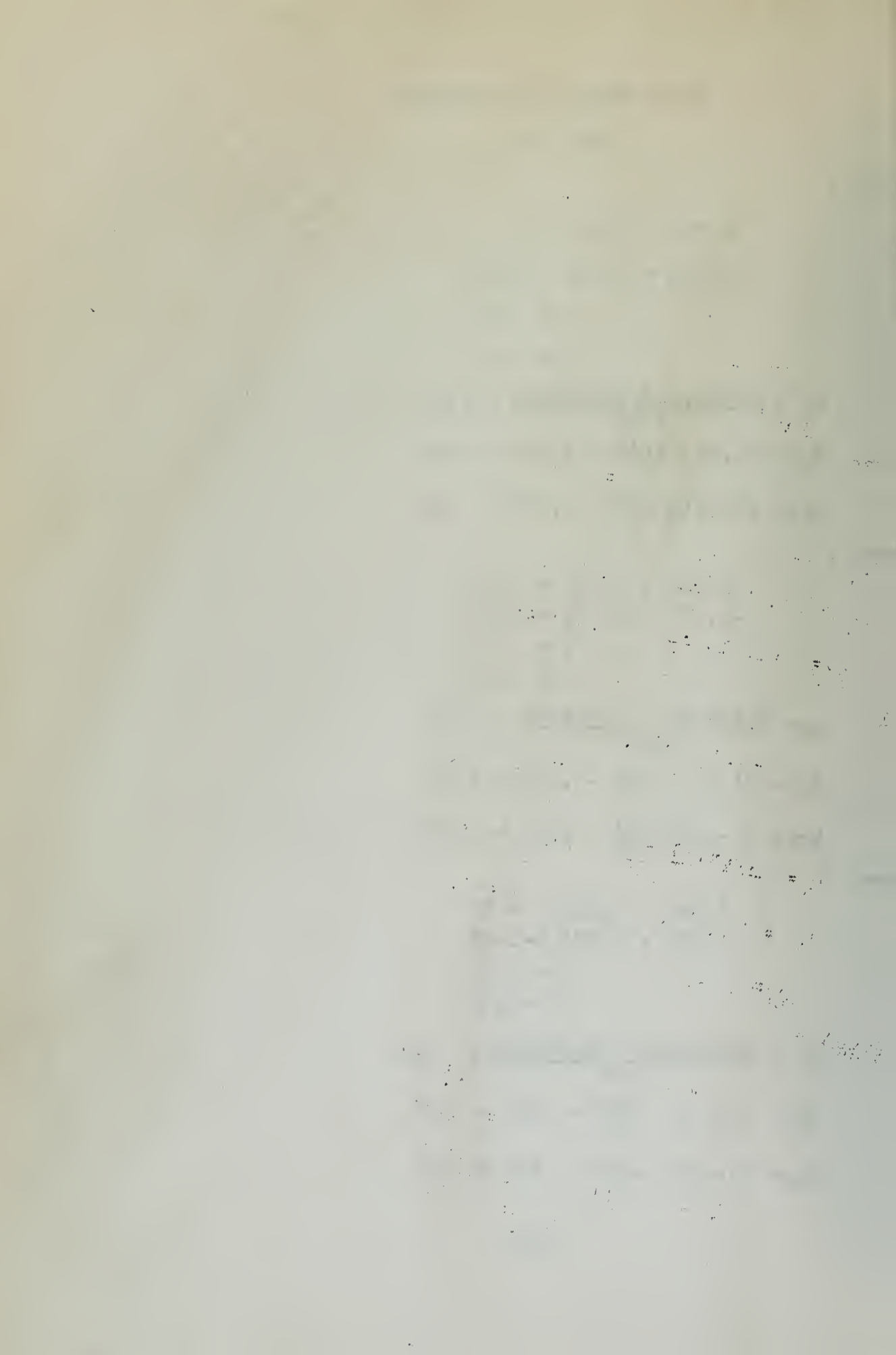
$$C = 1.13$$

$$D = -0.29$$

$$R_3 = \frac{2.95 \times 1.13 - 2.90 \times .29}{3.90} = .64$$

$$M_{CD} = 3\left(1.13 - \frac{.29}{2} - .64\right) = 1.08$$

$$M_{DC} = 3\left(-.29 + \frac{1.13}{2} - .64\right) = -1.08$$



Panel 4

$$\begin{aligned} 2.5D - E &= -2.32 \\ -D + 2.5E &= -1.88 \\ D &= -1.34 \\ E &= -1.46 \end{aligned}$$

$$R_4 = \frac{3}{4}(-1.34 - 1.46) = -2.10$$

$$M_{DE} = 4(-1.34 - \frac{1.46}{2} + 2.10) = .12$$

$$M_{ED} = 4(-1.46 - \frac{1.34}{2} + 2.10) = -.12$$

Panel 5

$$\begin{aligned} 2.5E - F &= -1.88 \\ -E + 2.5F &= -1.29 \\ E &= -1.14 \\ F &= -.97 \end{aligned}$$

$$R_5 = \frac{3}{4}(-1.14 - .97) = -1.58$$

$$M_{EF} = 4(-1.14 - \frac{.97}{2} + 1.58) = -.16$$

$$M_{FE} = 4(-.97 - \frac{1.14}{2} + 1.58) = .16$$

Panel 6

$$\begin{aligned} 2.53F - 1.02G &= -1.88 \\ -0.89F + 4.06G &= -1.62 \\ F &= -.99 \\ G &= -.62 \end{aligned}$$

$$R_6 = \frac{-2.95 \times .62 - 2.90 \times .60}{3.91} = -.77$$

$$M_{FG} = 3(-.99 - \frac{.62}{2} + .77) = -.40$$

$$M_{GF} = 3(-.62 - \frac{.99}{2} + .77) = .32$$

Panel 7

$$3.77G - 0.77H = -1.96$$

$$-0.63G + 5.34H = -1.85$$

$$G = -.60$$

$$H = -.42$$

$$R_7 = \frac{-2.91 \times .60 - 2.96 \times .42}{3.91} = -.77$$

$$M_{GH} = 2(-.60 - \frac{.42}{2} + .77) = -.12$$

$$M_{HG} = 2(-.42 - \frac{.60}{2} + .77) = .15$$

Panel 8

$$5.02H - 0.52I = -1.87$$

$$-0.20H + 6.72I = 0$$

$$H = -.37$$

$$I = -.01$$

$$R_8 = \frac{-2.83 \times .37 - 2.91 \times .01}{3.83} = -.28$$

$$M_{HI} = 2(-.37 - \frac{.01}{2} + .28) = -.18$$

$$M_{IH} = 2(-.01 - \frac{.37}{2} + .28) = .18$$

Second Moment Corrections - Load at C

Panel 1

$$\begin{aligned} 6.77A - 0.20B &= 0 \\ -0.52A + 5.02B &= -1.02 \\ A &= -.01 \\ B &= -.20 \end{aligned}$$

$$R_1 = \frac{-2.91 \times .01 - 2.83 \times .20}{3.83} = -.16$$

$$M_{AB} = 2(-.01 - \frac{.20}{2} + .16) = .10$$

$$M_{BA} = 2(-.20 - \frac{.01}{2} + .16) = -.10$$

Panel 2

$$\begin{aligned} 5.34B - 0.63C &= -.40 \\ -0.77B + 3.77C &= -1.08 \\ B &= -.11 \\ C &= -.28 \end{aligned}$$

$$R_2 = \frac{-2.96 \times .11 - 2.91 \times .28}{3.91} = -.30$$

$$M_{BC} = 2(-.11 - \frac{.28}{2} + .30) = .15$$

$$M_{CB} = 2(-.28 - \frac{.11}{2} + .30) = -.09$$

Panel 3

$$\begin{aligned} 4.06C - 0.89D &= 1.05 \\ -1.02C + 2.53D &= -.12 \\ C &= .27 \\ D &= .06 \end{aligned}$$

$$R_3 = \frac{2.95 \times .27 + 2.90 \times .06}{3.90} = .24$$

$$M_{CD} = 3(.27 + \frac{.06}{2} - .24) = .24$$

$$M_{DC} = 3(.06 + \frac{.27}{2} - .24) = -.16$$

Panel 4

$$2.5D - E = 1.08$$

$$-D + 2.5E = .16$$

$$D = .74$$

$$E = .36$$

$$R_5 = \frac{3}{4}(.74 + .36) = .82$$

$$M_{DE} = 4(.74 + \frac{.36}{2} - .82) = .40$$

$$M_{ED} = 4(.36 + \frac{.74}{2} - .82) = -.36$$

Panel 5

$$2.5E - F = .12$$

$$-E + 2.5F = .40$$

$$E = .13$$

$$F = .21$$

$$R_5 = \frac{3}{4}(.13 + .21) = .25$$

$$M_{EF} = 4(.13 + \frac{.21}{2} - .25) = -.08$$

$$M_{FE} = 4(.21 + \frac{.13}{2} - .25) = .08$$

Panel 6

$$2.53F - 1.02G = -.16$$

$$-0.89F + 4.06G = .12$$

$$F = -.06$$

$$G = .02$$

$$R_6 = \frac{-2.90 \times .06 + 2.95 \times .02}{3.90} = -.03$$

$$M_{FG} = 3(-.06 + \frac{.02}{2} + .03) = -.06$$

$$M_{GF} = 3(.02 - \frac{.06}{2} + .03) = .06$$

Panel 7

$$3.77G - 0.77H = -.32$$

$$-0.63G + 5.34H = .18$$

$$G = -.08$$

$$H = .02$$

$$R_7 = \frac{2.96 \times .02 - 2.91 \times .08}{3.91} = -.04$$

$$M_{GH} = 2(-.08 + \frac{.02}{2} + .04) = -.06$$

$$M_{HG} = 2(.02 - \frac{.08}{2} + .04) = .04$$

Panel 8

$$5.02H - 0.52I = -.15$$

$$-0.20H + 6.77I = 0$$

$$H = -.03$$

$$I = 0$$

$$R_8 = \frac{-2.83 \times .03}{3.83} = -.02$$

$$M_{HI} = 2(-.03 + .02) = -.02$$

$$M_{IH} = 2(\frac{-.03}{2} + .02) = .02$$

Load at PP2

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
-Q	4.56	5.38	4.98	5.23	-2.33	-2.38	-1.87	-1.87
×	0.71	1.14	1.14	1.62	-0.72	-0.76	-1.25	-1.25
R	4.07		3.80		-1.70		-2.34	
M'	-5.58	-5.16	-5.55	-4.83	2.40	2.32	1.88	1.88
-Q	0.00	5.55	5.16	-2.40	4.83	-1.88	-2.32	-1.88
×	0.33	1.11	0.91	-0.45	1.13	-0.29	-1.34	-1.46
R	1.07		0.35		0.64		-2.10	
M''	-0.36	0.40	1.02	-1.05	1.08	-1.08	0.12	-0.12
-Q	0.00	-1.02	-0.40	-1.08	1.05	-0.12	1.08	0.16
×	-0.01	-0.20	-0.11	-0.28	0.27	0.06	0.74	0.36
R	-0.16		-0.30		0.24		0.82	
M'''	0.10	-0.10	0.15	-0.09	0.24	-0.16	0.40	-0.36
M	-5.84	-4.81	-4.38	-5.97	3.72	1.08	2.40	1.40

1. The first part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations

(1)
$$\frac{dx}{dt} = f(x, y, z), \quad \frac{dy}{dt} = g(x, y, z), \quad \frac{dz}{dt} = h(x, y, z)$$

where f, g, h are continuous functions of x, y, z and satisfy the conditions

(2)
$$f(0, 0, 0) = 0, \quad g(0, 0, 0) = 0, \quad h(0, 0, 0) = 0$$

and the conditions

(3)
$$f(x, y, z) \neq 0, \quad g(x, y, z) \neq 0, \quad h(x, y, z) \neq 0$$

for all $(x, y, z) \neq (0, 0, 0)$.

It is shown that under these conditions the system (1) has a unique solution for any initial conditions

(4)
$$x(0) = x_0, \quad y(0) = y_0, \quad z(0) = z_0$$

and that the solution is unique in the neighborhood of the origin.

5		6		7		8	
E	F	F	G	G	H	H	I
-1.87	-1.87	-1.64	-1.60	-1.75	-1.67	-1.79	-1.45
-1.25	-1.25	-0.94	-0.60	-0.54	-0.37	-0.41	-0.23
-2.34		-1.56		-1.27		-1.45	
1.88	1.88	1.29	1.96	1.62	1.87	1.85	2.04
-1.88	-1.29	-1.88	-1.62	-1.96	-1.85	-1.87	0.00
-1.14	-0.97	-0.99	-0.62	-0.60	-0.42	-0.37	-0.01
-1.58		-1.20		-0.77		-0.28	
-0.16	0.16	-0.40	0.32	-0.12	0.15	-0.18	0.18
0.12	0.40	-0.16	0.12	-0.32	0.18	-0.15	0.00
0.13	0.21	-0.06	0.02	-0.08	0.02	-0.03	0.00
0.25		-0.03		-0.04		-0.02	
-0.08	0.08	-0.06	0.06	-0.06	0.04	-0.02	0.02
1.64	2.12	0.83	2.34	1.38	2.06	1.65	2.24

Influence Lines - First Correction

Load at Panel Pt 3 (= D)

Panel 1

$$6.77A - .2B = 0$$

$$A = .03$$

$$-.52A + 5.02B = 4.71$$

$$R_1 = \frac{(3 - .0866).03 + (3 - .1732).94}{2(2 - .0866)} = .72$$

$$M_{AB} = 2(.03 + \frac{.94}{2} - .72) = -.44$$

$$M_{BA} = 2(.94 + \frac{.03}{2} - .72) = .46$$

Panel 2

$$5.34B - .62C = 4.30$$

$$B = .98$$

$$-.76B + 3.77C = 4.84$$

$$C = 1.48$$

$$R_2 = \frac{(3 - .0443).98 + (3 - .0886)1.48}{2(2 - .0443)} = 1.84$$

$$M_{BC} = 3(.98 + \frac{1.48}{2} - 1.84) = -.36$$

$$M_{CB} = 3(1.48 + \frac{.98}{2} - 1.84) = .39$$

Panel 3

$$4.05C - .9D = 4.11$$

$$C = .84$$

$$-1.02C + 2.53D = -2.84$$

$$D = -.78$$

$$R_3 = \frac{(3 - .0482).84 + (3 - .0964)(-.78)}{2(2 - .0482)} = .06$$

$$M_{CD} = 4(.84 - \frac{.78}{2} - .06) = 1.56$$

$$M_{DC} = 4(-.78 + \frac{.84}{2} - .06) = -1.68$$

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Panel 4

$$2.5D - 1E = 3.36$$

$$-1D + 2.5E = -2.81$$

$$D = 1.07$$

$$E = -.70$$

$$R = \frac{3}{4}(1.07 - .70) = .28$$

$$M_{DE} = 4(1.07 - \frac{.70}{2} - .28) = 1.76$$

$$M_{ED} = 4(-.70 + \frac{1.07}{2} - .28) = -1.80$$

Panel 5

$$2.5F - 1E = -2.84$$

$$-1F + 2.5E = -1.93$$

$$E = -1.46$$

$$F = -1.72$$

$$R = \frac{3}{4}(-1.46 - 1.72) = -2.38$$

$$M_{FE} = 4(-1.72 - \frac{1.46}{2} + 2.38) = -.28$$

$$M_{EF} = 4(-1.46 - \frac{1.72}{2} + 2.38) = .24$$

Panel 6

$$4.05G - 0.9F = -2.43$$

$$-1.02G + 2.53F = -2.81$$

$$G = -.93$$

$$F = -1.48$$

$$R = \frac{-(3 - .0482) \cdot .93 - (3 - .0964)1.48}{2(2 - .0482)} = -1.80$$

$$M_{FG} = 4(-1.48 - \frac{.93}{2} + 1.80) = -.56$$

$$M_{GF} = 4(-.93 - \frac{1.48}{2} + 1.80) = .52$$

1844

Panel 7

$$5.34 H - .62 G = -2.78$$

$$-.76 H + 3.77 G = -2.94$$

$$G = -.91$$

$$H = -.63$$

$$R = - \frac{(3-.0443) .63 - (3-.0886) .91}{2(2-.0443)} = -1.15$$

$$M_{GH} = 3(-.91 - \frac{.63}{2} + 1.15) = -.21$$

$$M_{HG} = 3(-.63 - \frac{.91}{2} + 1.15) = .21$$

Panel 8

$$6.77 I - .2 H = 0$$

$$-.52 I + 5.02 H = -2.80$$

$$H = -.56$$

$$I = -.02$$

$$R = - \frac{(3-.0866) .02 - (3-.1732) .56}{2(2-.0866)} = -.43$$

$$M_{HI} = 2(-.56 - \frac{.02}{2} + .43) = -.28$$

$$M_{IH} = 2(-.02 - \frac{.56}{2} + .43) = .26$$

Influence Lines - Second Correction

Load @ PP3 = D

Panel 1

$$6.77 A - .2 B = 0$$

$$-.52 A + 5.02 B = +.44$$

$$A = .003$$

$$B = .090$$

$$R_1 = \frac{(3 - .0866) \cdot 0.003 + (3 - 1.732) \cdot .09}{2(2 - .0866)} = .094$$

$$M_{AB} = 2(.003 + \frac{.090}{2} - .094) = -.09$$

$$M_{BA} = 2(.090 + .003 - .094) = -.01$$

Panel 2

$$5.34 B - .62 C = -.46$$

$$-.76 B + 3.77 C = 1.56$$

$$B = -.04$$

$$C = .41$$

$$R_2 = \frac{(3 - .0443) \cdot -.04 + (3 - .0886)(+.41)}{2(2 - .0443)} = .28$$

$$M_{BC} = 3(-.04 + \frac{.41}{2} - .28) = -.36$$

$$M_{CB} = 3(+.41 - \frac{.04}{2} - .28) = .33$$

Panel 3

$$4.05 C - 0.9 D = -.39$$

$$-1.02 C + 2.53 D = -1.76$$

$$C = -.27$$

$$D = -.81$$

$$R_3 = \frac{(3 - .0482)(-.27) + (3 - .0964)(-.81)}{2(2 - .0482)} = -.80$$

$$M_{CD} = 4(-.27 - \frac{.81}{2} + .80) = .52$$

$$M_{DC} = 4(-.81 - \frac{.27}{2} + .80) = -.44$$

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Panel 4

$$2.5 D - 1E = 1.68$$

$$-1.0 D + 2.5 E = -.24$$

$$D = .75$$

$$E = .21$$

$$R_4 = \frac{3}{4} (.75 + .21) = .72$$

$$M_{DE} = 4(.75 + \frac{.21}{2} - .72) = .52$$

$$M_{ED} = 4(.21 + \frac{.75}{2} - .72) = -.56$$

Panel 5

$$-1 F + 2.5 E = 1.80$$

$$2.5 F + 1.0 E = 1.56$$

$$E = .96$$

$$F = .61$$

$$R_5 = \frac{3}{4} (.96 + .61) = 1.18$$

$$M_{EF} = 4(.96 + \frac{.61}{2} - 1.18) = .32$$

$$M_{FE} = 4(.61 + \frac{.96}{2} - 1.18) = -.40$$

Panel 6

$$-1.02 G + 2.53 F = .28$$

$$4.05 G - 0.9 F = .21$$

$$G = .08$$

$$F = .14$$

$$R_6 = \frac{(3-.0482).08 + (3-.0964).14}{2(2-.0482)} = .16$$

$$M_{FG} = 4(.14 + \frac{.08}{2} - .16) = .08$$

$$M_{GF} = 4(.08 + \frac{.14}{2} - .16) = -.04$$

Panel 7

$$-.76 H + 3.77 G = -.52$$

$$5.34 H - .62 G = .28$$

$$H = .04$$

$$G = -.13$$

$$R_7 = \frac{(3-.0443).04 - (3-.0886).13}{2(2-.0443)} = -.07$$

$$M_{GH} = 3(-.13 + \frac{.04}{2} + .07) = -.12$$

$$M_{HG} = 3(.04 - \frac{.13}{2} + .07) = .15$$

Panel 8

$$-.52 I + 5.02 H = -.21$$

$$6.77 I - 0.20 H = 0$$

$$I = 0$$

$$H = -.04$$

$$R_8 = -\frac{(3-.1732).04}{2(2-.0866)} = -.03$$

$$M_{HI} = 2(-.04 + .03) = -.02$$

$$M_{IH} = 2(-\frac{.04}{2} + .03) = .02$$

Load At PP3 = D

Panel Point	1		2		3		4	
	A	B	B	C	C	D	D	E
Q	3.81	4.49	4.16	4.36	4.02	4.12	-2.81	-2.81
Q	.59	.96	.94	1.34	1.49	2.23	-1.87	-1.87
R	3.40		3.18		3.81		-3.51	
M'	-4.66	-4.30	-4.71	-4.11	-4.84	-3.36	2.84	2.84
-Q	0	4.71	4.30	4.84	4.11	-2.82	3.36	-2.81
Q	.03	.94	.98	1.48	.84	-.78	1.07	-.70
R	.72		1.84		.06		.28	
M''	-.44	.46	-.36	.39	1.56	-1.68	1.76	-1.80
-Q	0	.44	-.46	1.56	-.39	-1.76	1.68	-.24
Q	.003	.090	-.04	.41	-.27	-.81	.75	.21
R	.094		.28		-.80		.72	
M'''	-.09	-.01	-.36	.33	.52	-.44	.52	-.56
Σ M	-5.19	-3.85	-5.43	-3.39	-2.76	-5.48	5.12	.48

Table 1

Page 1

Date		Time		Location		Remarks	
1911	10/1	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/2	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/3	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/4	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/5	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/6	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/7	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/8	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/9	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/10	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/11	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/12	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/13	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/14	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/15	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/16	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/17	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/18	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/19	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/20	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/21	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/22	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/23	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/24	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/25	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/26	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/27	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/28	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/29	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/30	10:00	10:30	10:00	10:30	10:00	10:30
1911	10/31	10:00	10:30	10:00	10:30	10:00	10:30

cont.)

[illegible]

Influence Lines - First Corrections
Load at E

Panels 1 & 8

$$6.77A - 0.20B = 0 \quad A = .02$$

$$-0.52A + 5.02B = 3.72 \quad B = .72$$

$$R_1 = \frac{2.914 \times .02 + 2.828 \times .72}{3.828} = .55$$

$$M_{AB} = 2\left(.02 + \frac{.72}{2} - .55\right) = -.34$$

$$M_{BA} = 2\left(.72 + \frac{.02}{2} - .55\right) = .36$$

Panels 2 & 7

$$5.34B - 0.63C = 3.60 \quad B = .81$$

$$-0.77B + 3.77C = 3.84 \quad C = 1.18$$

$$R_2 = \frac{2.96 \times .81 + 2.91 \times 1.18}{3.912} = 1.49$$

$$M_{BC} = 3\left(.81 + \frac{1.18}{2} - 1.49\right) = -.27$$

$$M_{CB} = 3\left(1.18 + \frac{.81}{2} - 1.49\right) = .27$$

Panels 3 & 6

$$4.06C - 0.89D = 3.24 \quad C = 1.23$$

$$-1.02C + 2.53D = 3.76 \quad D = 1.99$$

$$R_3 = \frac{2.95 \times 1.23 + 2.90 \times 1.99}{3.904} = 2.40$$

$$M_{CD} = 4\left(1.23 + \frac{1.99}{2} - 2.40\right) = -.72$$

$$M_{DC} = 4\left(1.99 + \frac{1.23}{2} - 2.40\right) = .80$$

Panels 4 & 5

$$2.5E - 1.0D = 2.68$$

$$-1.0E + 2.5D = -3.75$$

$$R_4 = \frac{3}{4}(-1.28 + .56) = -.54$$

$$M_{DE} = 4\left(-1.28 + \frac{.56}{2} + .54\right) = -1.84$$

$$M_{ED} = 4\left(.56 - \frac{1.28}{2} + .54\right) = 1.84$$

The following is a list of the names of the members of the American Medical Association who have been elected to the office of President for the year 1917.

The President of the American Medical Association for the year 1917 is Dr. J. C. Brannan, of the University of Illinois.

The Vice-President of the American Medical Association for the year 1917 is Dr. J. H. Hays, of the University of Michigan.

The Secretary of the American Medical Association for the year 1917 is Dr. J. H. Hays, of the University of Michigan.

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The Treasurer of the American Medical Association for the year 1917 is Dr. J. H. Hays, of the University of Michigan.

Influence Lines - Second Correction

Load at E

Panels 1 & 8

$$6.77A - 0.20B = 0$$

$$A = 0$$

$$-0.52A + 5.02B = .27$$

$$B = .05$$

$$R_4 = .04$$

$$R_1 = \frac{2.914 \times 0 + 2.828 \times .05}{3.828}$$

$$M_{AB} = 2 \left(0 + \frac{.05}{2} - .04 \right) = -.04$$

$$M_{BA} = 2 \left(.05 + \frac{0}{2} - .04 \right) = .02$$

Panels 2 & 7

$$5.34B - 0.63C = -.36$$

$$B = -.05$$

$$-0.77B + 3.77C = .72$$

$$C = .18$$

$$R_2 = \frac{-2.96 \times .05 + 2.91 \times .18}{3.912}$$

$$R_4 = .10$$

$$M_{BC} = 3 \left(-.05 + \frac{.18}{2} - .10 \right) = -.18$$

$$M_{CB} = 3 \left(.18 - \frac{.05}{2} - .10 \right) = .18$$

Panels 3 & 6

$$4.06C - 0.89D = -.27$$

$$C = -.24$$

$$-1.02C + 2.53D = 1.84$$

$$D = -.86$$

$$R_3 = \frac{2.95(-.25) + 2.90(-.82)}{3.904}$$

$$R_3 = -.80$$

$$M_{CD} = 4 \left(-.25 - \frac{.82}{2} + .80 \right) = .56$$

$$M_{DC} = 4 \left(-.82 - \frac{.25}{2} + .80 \right) = -.56$$

Panels 4 & 5

$$2.5E - 1.0D = -.80$$

$$D = -.02$$

$$-1.0E + 2.5D = 1.84$$

$$E = .73$$

$$R_4 = \frac{3}{4}(-.02 + .73)$$

$$R_4 = .53$$

$$M_{DE} = 4 \left(-.02 + \frac{.73}{2} + .53 \right) = -.76$$

$$M_{ED} = 4 \left(.73 - \frac{.02}{2} - .53 \right) = .76$$

1. 5. 1.
2. 5. 2.
3. 5. 3.

1. 5. 1. - 1. 5. 1.
2. 5. 2. - 1. 5. 2.

1. 5. 1.
2. 5. 2.
3. 5. 3.

1. 5. 1.
2. 5. 2.
3. 5. 3.

1. 5. 1. - 1. 5. 1.
2. 5. 2. - 1. 5. 2.

Load at Panel Pt 4 = E

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
-Q	3.04	3.59	3.32	3.49	3.21	3.30	3.75	3.75
α	.47	.76	.75	1.08	1.19	1.78	2.50	2.50
R	2.79		2.53		3.04		4.69	
M'	-3.88	-3.60	-3.72	-3.24	-3.84	-2.68	-3.76	-3.76
-Q	0	3.72	3.60	3.84	3.24	3.76	2.68	-3.75
α	.02	.72	.81	1.18	1.23	1.99	-1.28	.56
R	.55		1.49		2.40		- .54	
M''	- .34	.36	- .27	.27	- .72	.80	1.84	-1.84
-Q	0	.27	- .36	.72	- .27	-1.84	- .80	1.84
α	0	.05	- .05	.18	- .25	- .82	- .02	.73
R	.04		.10		- .80		.53	
M''	- .04	.02	- .18	.18	.56	- .56	- .76	.76
M'''	-4.26	-3.32	-4.17	-2.79	-4.00	-2.44	-2.68	-4.84

Panel	5		6		7		8	
Joint	E	F	F	G	G	H	H	I
-Q	-3.75	-3.75	-3.29	-3.20	-3.50	-3.33	-3.58	-2.91
α	-2.50	-2.50	-1.87	-1.20	-1.08	-0.75	-0.83	-0.45
R	-4.69		-3.12		-2.53		-2.91	
M	3.75	3.75	2.58	3.92	3.24	3.73	3.60	4.08
-Q	3.76	-2.58	-3.75	-3.24	-3.92	-3.60	-3.72	0
α	1.30	- .51	-1.98	-1.23	-1.20	- .81	- .72	- .02
R	.59		-2.40		-1.51		- .55	
M'	1.84	1.80	- .76	.72	- .27	.30	- .36	.34
-Q	-1.84	.76	1.80	.27	- .72	.36	- .30	0
α	- .73	.02	.82	.25	- .18	.05	- .05	0
R	- .53		.80		- .10		- .04	
M''	- .76	.76	.56	- .56	- .18	.18	- .02	.04
M'''	4.83	2.71	2.38	4.08	2.79	4.18	3.22	4.26

Preliminary Moment Computations - Web Members

Member AA'

Moment Dh	=	3144	fk
hh E-60	=	2865	
Impact	=	<u>615</u>	
Total		3480	
hh H-15-S-12 44	=	368	
Conc	=	86	
Impact	=	<u>50</u>	
Total		504	
Sidewalk hh	=	220	
Design Moment	=	7362	fk

Member BB'

Dh	=	5170	
hh E-60	=	4410	
Impact	=	<u>950</u>	
Total		5360	
hh H15-S-12 44	=	605	
Conc.	=	125	
Impact	=	<u>83</u>	
Total		813	
Sidewalk hh	=	362	
Design Moment	=	11,745	fk

Member CC'

Dh	=	3000	
hh E-60	=	2630	
Impact	=	<u>830</u>	
Total		3460	
hh H15-S-12-44	=	350	
Conc.	=	92	
Impact	=	<u>67</u>	
Total		509	
Sidewalk hh	=	256	
Design Moment	=	7243	fk

Member DD'

DL = 1600

LL E-60 = 1480

Impact = 520

Total 2000

LL H15-S12-44 = 182

Conc. = 69

Impact = 37

Total 288

Sidewalk = 144

Design Moment = 4046 fk

Member EE'

DL = 945

LL E-60 = 910

Impact = 441

Total 1351

LL H15-S12-44 = 110

Conc. = 52

Impact = 26

Total 188

Sidewalk = 97

Design Moment = 2593 fk

Preliminary Moment Computations - Chord Members

Member AB

$$DL = 3440$$

$$LL \text{ E-60} = 3020$$

$$\text{Impact} = \underline{695}$$

$$\text{Total} = 3715$$

$$LL \text{ H15-S12-44} = 403$$

$$\text{Conc.} = 87$$

$$\text{Impact} = \underline{73}$$

$$\text{Total} = 563$$

$$\text{Sidewalk hh} = 240$$

$$\text{Design Moment} = 7958 \text{ fk}$$

Member BC

$$DL = 2260$$

$$LL \text{ E-60} = 2040$$

$$\text{Impact} = \underline{520}$$

$$\text{Total} = 2560$$

$$LL \text{ H15-S12-44} = 264$$

$$\text{Conc.} = 50$$

$$\text{Impact} = \underline{52}$$

$$\text{Total} = 366$$

$$\text{Sidewalk hh} = 173$$

$$\text{Design Moment} = 5360 \text{ fk}$$

Member CD

DL = 1432

LL E-60 = 1330

Impact = 383

Total 1713

LL H15-S12-44 = 168

Conc. = 73

Impact = 44

Total 285

Sidewalk = 118

Design Moment = 3548 fk

Member DE

DL = 1480

LL E-60 = 1400

Impact = 490

Total 1890

LL H15-S12-44 = 173

Conc. = 66

Impact = 49

Total 288

Sidewalk = 133

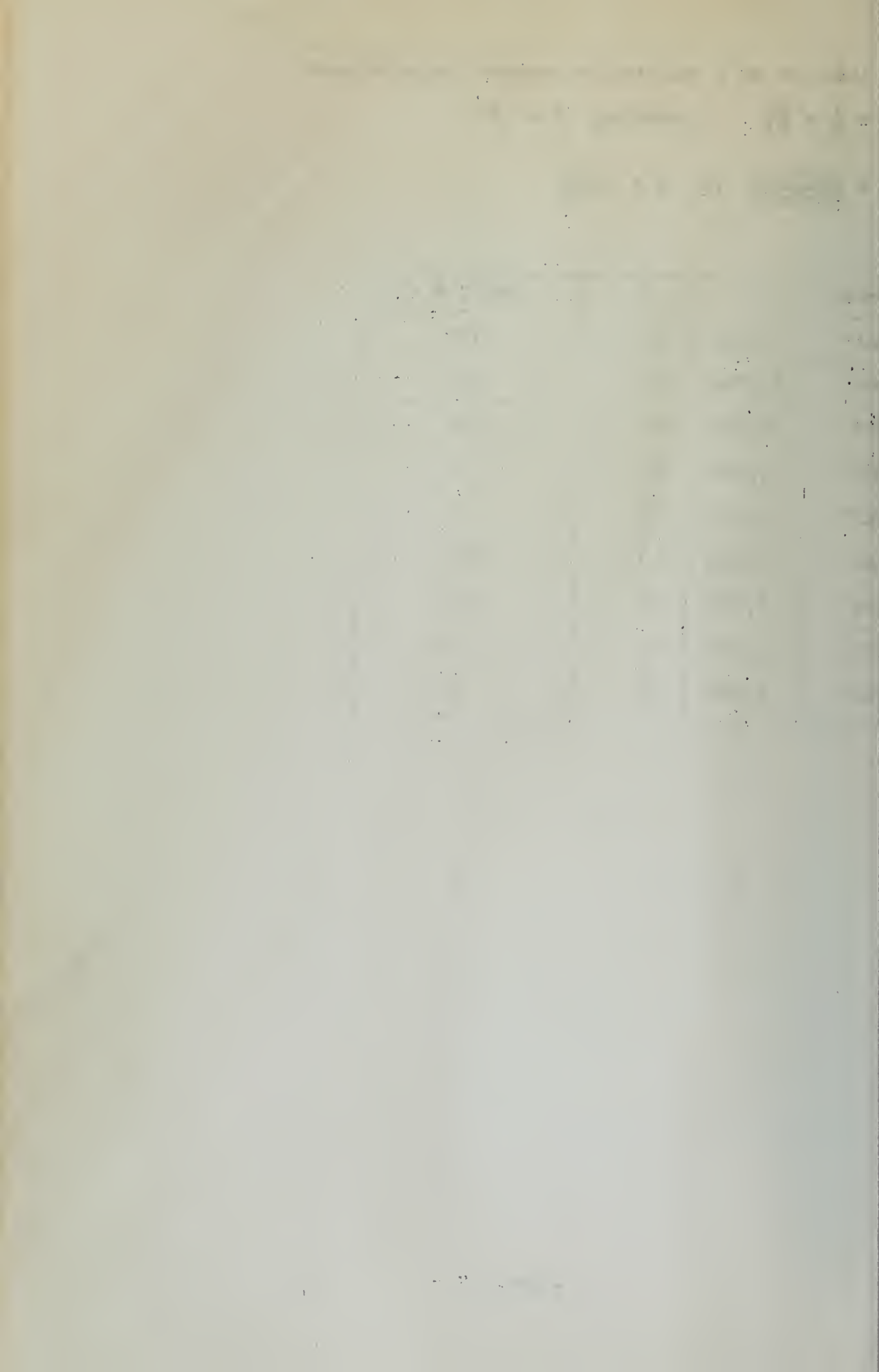
Design Moment = 3790 fk

Determination of K values for second computations

$$K = \frac{I}{L} = \frac{Mc}{fL}$$
 Assuming $C = 15''$

$$K = \frac{N \times 15 \times 12}{20 \times L \times 12} \text{ or } K = .75 \frac{M}{L}$$

Member	M	L	.75M/L = K
AA'	7362	35	160
BB'	11,745	38	232
CC'	7,243	40	136
DD'	4,064	41	74
EE'	2,593	41	47
AB	7,958	30	200
BC	5,360	30	134
CD	3,548	30	90
DE	3,790	30	95



Influence Line Computations - Second Set
Load at B

Panel 1

$$\begin{aligned} -Q_A &= \frac{(.0942 \times 160 - 200)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)200} = 0.1 \\ -Q_B &= \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28 \\ Q_{R1} &= \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)200} = 0.31 \end{aligned}$$

Panel 2

$$\begin{aligned} -Q_B &= \frac{(.0463 \times 232 - 134)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)134} = -1.11 \\ -Q_C &= \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21 \\ Q_{R2} &= \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)134} = -.009 \end{aligned}$$

Panel 3

$$\begin{aligned} -Q_C &= \frac{(.0507 \times 136 - 90)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)90} = -1.10 \\ -Q_D &= \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19 \\ Q_{R3} &= \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)90} = -0.13 \end{aligned}$$

Panel 4

$$\begin{aligned} -Q_D &= \frac{-95(.125 \times 30)}{4 \times 95} = -.94 \\ -Q_E &= \frac{(-.125 \times 30)}{4} = -.94 \\ Q_{R4} &= \frac{(-.125 \times 30)}{4 \times 95} = -.01 \end{aligned}$$

Panel 5

$$-Q_E = \frac{-1.25 \times 30}{4} = -.94$$

$$-Q_F = \frac{-1.25 \times 30}{4} = -.94$$

$$Q_{E5} = \frac{-1.25 \times 30}{4 \times 95} = -.0099$$

Panel 6

$$-Q_G = \frac{(.0507 \times 136 - 90)(-.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)90} = -.76$$

$$-Q_F = \frac{(-1.25 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -.82$$

$$Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)90} = -.0091$$

Panel 7

$$-Q_H = \frac{(.0463 \times 134 - 134)(-.0443 \times 7.5 + .125 \times 30)}{2(2 - .0443)134} = -.81$$

$$-Q_G = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)} = -.87$$

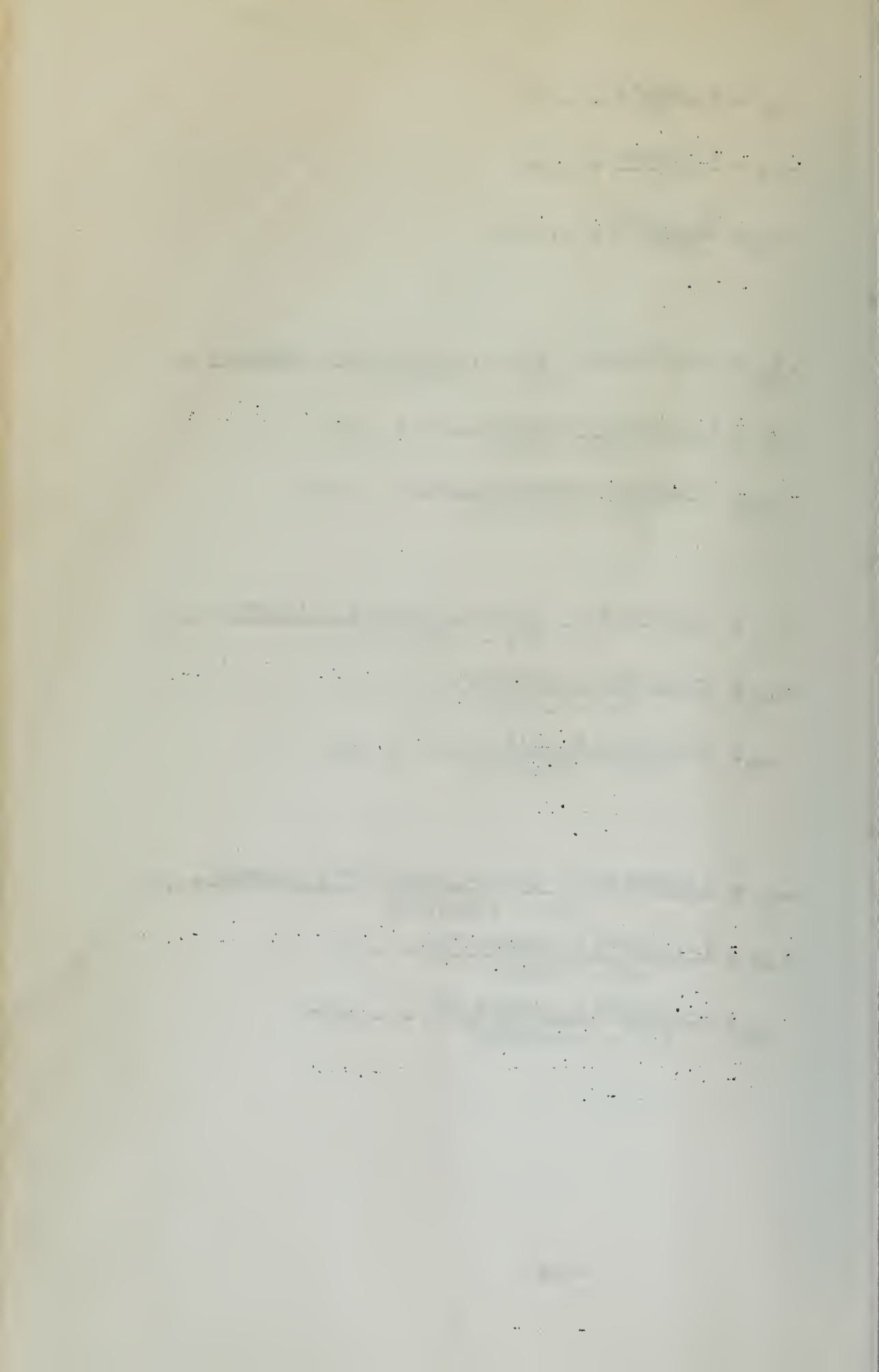
$$Q_{R7} = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)134} = -.065$$

Panel 8

$$-Q_I = \frac{(.0942 \times 160 - 200)(-.0866 \times 3.75 + .125 \times 30)}{2(2 - .0866)200} = -.83$$

$$-Q_H = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -.90$$

$$Q_{R8} = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)200} = -.0045$$



Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)200} = 4.98$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)200} = 0.27$$

Panel 2

$$-Q_B = \frac{(.0463 \times 232 - 134)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)134} = 4.82$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.24$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)134} = 0.39$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)90} = -2.20$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.39$$

$$Q_{R3} = \frac{-.25 \times 30 - .0482 \times 37.5}{2(2 - .0482)90} = -.027$$

Panel 4

$$-Q_D = \frac{(-95)(.25 \times 30)}{4 \times 95} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30)}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4 \times 95} = -.020$$

1. The first part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations

$$\frac{dx}{dt} = P(x, y, z), \quad \frac{dy}{dt} = Q(x, y, z), \quad \frac{dz}{dt} = R(x, y, z),$$

where P, Q, R are continuous functions of x, y, z in a certain domain.

2. In the second part we consider the case when the functions P, Q, R are linear in x, y, z .

$$\frac{dx}{dt} = a_1x + b_1y + c_1z, \quad \frac{dy}{dt} = a_2x + b_2y + c_2z, \quad \frac{dz}{dt} = a_3x + b_3y + c_3z,$$

where a_i, b_i, c_i are constants.

3. In the third part we consider the case when the functions P, Q, R are quadratic in x, y, z .

4. In the fourth part we consider the case when the functions P, Q, R are cubic in x, y, z .

5. In the fifth part we consider the case when the functions P, Q, R are of higher order in x, y, z .

6. In the sixth part we consider the case when the functions P, Q, R are of arbitrary order in x, y, z .

7. In the seventh part we consider the case when the functions P, Q, R are of arbitrary order in x, y, z .

8. In the eighth part we consider the case when the functions P, Q, R are of arbitrary order in x, y, z .

9. In the ninth part we consider the case when the functions P, Q, R are of arbitrary order in x, y, z .

10. In the tenth part we consider the case when the functions P, Q, R are of arbitrary order in x, y, z .

11. In the eleventh part we consider the case when the functions P, Q, R are of arbitrary order in x, y, z .

Panel 5

$$-Q_E = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -.020$$

Panel 6

$$-Q_F = -1.64$$

$$-Q_G = -1.52$$

$$Q_{R6} = -.018$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.62$$

$$Q_{R7} = -.013$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.66$$

$$Q_{R8} = -.0090$$

Load at D

Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)200} = 4.15$$

$$-Q_B = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)200} = .022$$

Panel 2

$$-Q_B = \frac{(.0463 \times 232 - 134)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)134} = 4.02$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)134} = .033$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)90} = 3.80$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)90} = .046$$

Panel 4

$$-Q_D = \frac{(-.95)(.375 \times 30)}{4 \times 95} = -2.81$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.81$$

$$Q_{R4} = \frac{(-.375 \times 30)}{4 \times .95} = .030$$

1870

1871

1872

1873

1874

1875

1876

1877

1878

1879

1880

1881

Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R5} = -.030$$

Panel 6

$$-Q_F = -2.46$$

$$-Q_G = -2.28$$

$$Q_{R6} = -0.27$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.43$$

$$Q_{R7} = -.020$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.49$$

$$Q_{R8} = -.014$$

1870
1871
1872

1873
1874
1875

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1878

1879
1880
1881

Load at E

Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)200} = 3.32$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)} = 3.59$$

$$Q_{R1} = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)200} = .018$$

Panel 2

$$-Q_B = \frac{(.0463 \times 132 - 134)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)134} = 3.22$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R2} = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)134} = .026$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)90} = 3.04$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

$$Q_{R3} = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)90} = .037$$

Panel 4

$$-Q_D = \frac{(-95)(-.5 \times 30)}{4 \times 95} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R4} = \frac{.5 \times 30}{4 \times 95} = .040$$

My dear Mr. Brewster,

I have just received your letter of the 17th inst.

and am glad to hear from you.

I have been thinking of you very much lately.

I hope you are well and happy.

I am very truly yours,

Wm. Brewster

My dear Mr. Brewster,

I have just received your letter of the 17th inst.

and am glad to hear from you.

I hope you are well and happy.

I am very truly yours,

Panel 5

$$-Q_E = -3.78$$

$$-Q_F = -3.78$$

$$Q_{R5} = -.040$$

Panel 6

$$-Q_E = -3.28$$

$$-Q_G = -3.04$$

$$Q_{R6} = -.036$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.24$$

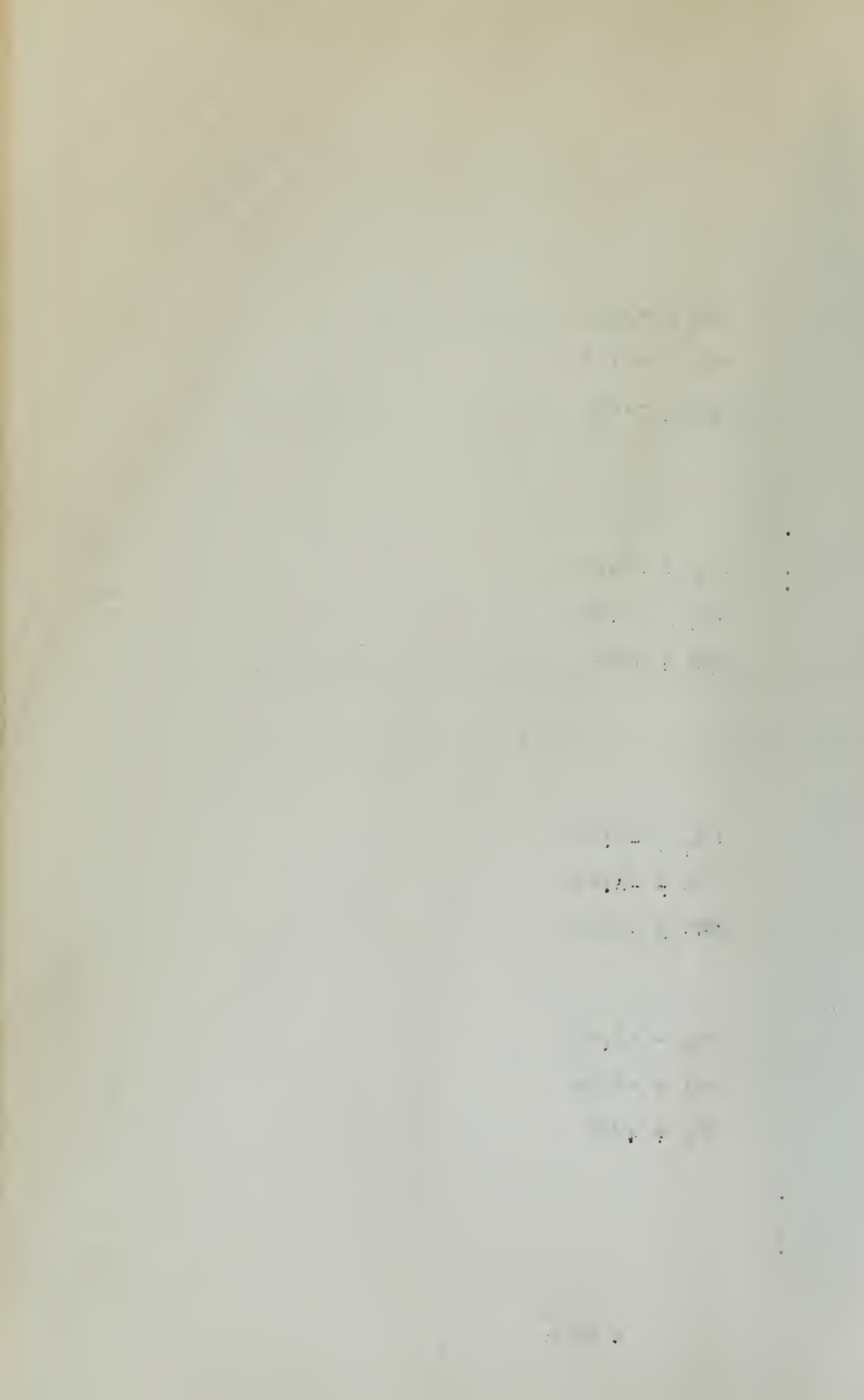
$$Q_{R7} = -.026$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.32$$

$$Q_{R8} = .018$$



Panel Constant Computations Load at B

Panel 1

$$\left[1.5 \times 160 + 200 + \frac{(3 - .0866)(.0942 \times 160 - 200)}{2(2 - .0866)} \right] A + \left[\frac{200}{2} + \frac{(3 - .1734)(.0942 \times 160 - 200)}{2(2 - .0866)} \right] B = 5.82$$

$$299A - 37B = 5.82$$

$$\left[200 + 1.5 \times 232 - \frac{(3 - .1732)200}{2(2 - .0866)} \right] B + \left[\frac{200}{2} - \frac{(3 - .0866)200}{2(2 - .0866)} \right] = 6.28$$

$$400B - 52A = 6.28$$

Solving Simultaneously: $A = .022$ $B = .019$

$$R_1 = \frac{(3 - .0866)(.022) + (3 - .1732)(.019)}{2(2 - .0866)} + .031 = .062$$

Panel 2

$$\left[1.5 \times 232 + 134 + \frac{(3 - .0443)(.0463 \times 232 - 134)}{2(2 - .0443)} \right] B + \left[\frac{134}{2} + \frac{(3 - .0886)(.0463 \times 232 - 134)}{2(2 - .0443)} \right] C = -1.11$$

$$\left[134 + 1.5 \times 136 - \frac{(3 - .0886)134}{2(2 - .0443)} \right] C + \left[\frac{134}{2} - \frac{(3 - .0443)134}{2(2 - .0443)} \right] B = -1.21$$

$$238C - 34B = -1.21$$

Solving Simultaneously: $B = -.003$ $C = -.005$

$$R_2 = \frac{(3 - .0443)(-.003) + (3 - .0886)(-.005)}{2(2 - .0443)} - .009 = -.015$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

where

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

and

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Panel 3

$$.5x136 + 90 + \frac{(3-.0482)(.0507x136-90)}{2(2-.0482)} \Big] C \Big[\frac{90 + (3-.0964)(.0507x136-90)}{2} \frac{1}{2(2-.0482)} \Big]$$

$$D = -1.10$$

$$231C - 17D = 1.10$$

$$0 + 1.5x74 - \frac{(3-.0964)90}{2(2-.0482)} \Big] D + \frac{90 - (3-.0482)90}{2} \Big] C = -1.19$$

$$134D - 23C = -1.19$$

Solving Simultaneously: $C = -.0055; D = -.0098$

$$R_3 = \frac{(3-.0482)(-.0055) + (3-.0964)(-.0098)}{2(2-.0482)} - .013 = -.024$$

Panel 4

$$.5x74 + 95 + \frac{(3)(0-95)}{4} \Big] D + \frac{95 + (3)(0-95)}{2} \Big] E = -.94$$

$$135D - 24E = -.94$$

$$+ 1.5x47 - \frac{(3)95}{4} \Big] E + \frac{95 - (3)95}{2} \Big] D = -.94$$

$$94E - 24D = -.94$$

Solving Simultaneously $D = -.0092; E = -.012$

$$R_4 = \frac{3(-.0092) + 3(-.012)}{4} - .01 = -.026$$

1871

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Panel 5

$$135E - 24F = -.94$$

$$-24E + 94F = -.94$$

$$E = -.012$$

$$F = -.0092$$

$$R_5 = \frac{3}{4} (-.0092 - .012) - .0099 = -.026$$

Panel 6

$$134F - 23G = -.82$$

$$-17F + 231G = -.76$$

$$F = -.0068$$

$$G = -.0039$$

$$R_6 = \frac{-2.95 \times .0039 - 2.90 \times .0068}{3.90} - .0091 = -.0173$$

Panel 7

$$238G - 34H = -.87$$

$$-25G + 389H = -.81$$

$$G = -.0040$$

$$H = -.0023$$

$$R_7 = \frac{-2.96 \times .0023 - 2.91 \times .0040}{3.91} - .0065 = -.0112$$

Panel 8

$$400H - 52I = -.90$$

$$-37H + 299I = -.83$$

$$H = -.0027$$

$$I = -.0031$$

$$R_8 = \frac{-2.91 \times .0031 - 2.83 \times .0027}{3.83} - .0045 = -.0088$$

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Panel Constant Computations - Load at C

Panel 1

$$299A - 37B = 4.98$$

$$-52A + 400B = 5.38$$

$$A = .019, B = .016$$

$$R_1 = \frac{2.91(.019) + 2.83(.016)}{2(1.91)} + .027 = .053$$

Panel 2

$$389B - 25C = 4.82$$

$$-34B + 238C = 5.24$$

$$B = .014, C = .024$$

$$R_2 = \frac{2.96(.014) + (2.91)(.024)}{3.92} + .039 = .067$$

Panel 3

$$231C - 17D = -2.20$$

$$-23C + 134D = -2.39$$

$$C = -.011, D = -.020$$

$$R_3 = \frac{2.95(-.011) + 2.90(-.020)}{3.90} + (-.027) = -.050$$

Panel 4

$$135D - 24E = -1.87$$

$$-24D + 94E = -1.87$$

$$D = -.018, E = -.025$$

$$R_4 = \frac{3(-.018) + 3(-.025)}{4} + (-.020) = -.052$$

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Panel 5

$$E = -.024$$

$$F = -.018$$

$$R_5 = -.052$$

Panel 6

$$F = -.014$$

$$G = -.0078$$

$$R_6 = -.034$$

Panel 7

$$G = -.0080$$

$$H = -.0046$$

$$R_7 = -.022$$

Panel 8

$$H = -.0054$$

$$I = -.0062$$

$$R_8 = -.018$$

Panel Constant Computations - Load at PP3

Panel 1

$$299A - 37B = 4.15$$

$$-52A + 400B = 4.49$$

Solving Simultaneously; $A = .016$, $B = .013$

$$R_1 = \frac{2.91(.016) + 2.83(.013)}{3.82} + .022 = .044$$

Panel 2

$$389B - 25C = 4.02$$

$$-34B + 238C = 4.36$$

Solving Simultaneously; $B = .012$, $C = .020$

$$R_2 = \frac{2.96(.012) + 2.91(.020)}{3.92} + .033 = .057$$

Panel 3

$$231C - 17D = 3.80$$

$$-23C + 134D = 4.12$$

Solving Simultaneously; $C = .019$, $D = .034$

$$R_3 = \frac{2.95(.019) + 2.90(.034)}{3.90} + .046 = .086$$

Panel 4

$$135D - 24E = -2.81$$

$$-24D + 94E = -2.81$$

Solving Simultaneously; $D = -.027$, $E = -.037$

$$R_4 = \frac{3(-.027) + 3(-.037)}{4} + (-.03) = -.078$$

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1978

Panel 5

$$E = -.036$$

$$F = -.028$$

$$R_5 = -.078$$

Panel 6

$$F = +.020$$

$$G = -.012$$

$$R_6 = -.051$$

Panel 7

$$G = -.012$$

$$H = -.0069$$

$$R_7 = -.033$$

Panel 8

$$H = -.0081$$

$$I = -.0093$$

$$R_8 = -.026$$

Panel Constant Computations - Load at E

Panel 1

$$299A - 37B = 3.32$$

$$-52A + 400B = 3.59$$

$$A = .012, B = .011$$

$$R_1 = \frac{2.91(.012) + 2.83(.011)}{3.82} + .018 = .035$$

Panel 2

$$389B - 25C = 3.22$$

$$-34B + 238C = 3.49$$

$$B = .009, C = .016$$

$$R_2 = \frac{2.96(.009) + 2.91(.016)}{3.92} + .026 = .045$$

Panel 3

$$231C - 17D = 3.04$$

$$-23C + 134D = 3.30$$

$$C = .015, D = .027$$

$$R_3 = \frac{2.95(.015) + 2.90(.027)}{3.90} + .037 = .069$$

Panel 4

$$135D - 24E = 3.75$$

$$-24D + 94E = 3.75$$

$$D = .036, E = .049$$

$$R_4 = \frac{3(.036) + 3(.049)}{4} + .040 = .10$$

Panel 5

$$E = -.048$$

$$F = -.037$$

$$R_5 = -.104$$

Panel 6

$$F = -.027$$

$$G = -.016$$

$$R_6 = -.068$$

Panel 7

$$G = -.016$$

$$H = -.0092$$

$$R_7 = -.044$$

Panel 8

$$H = -.011$$

$$I = -.012$$

$$R_8 = -.035$$

Moment Determination

Load at PPl

$$M = K(A + \frac{B}{2} - R) \quad FM_{AB}$$

Panel 1

$$M_{AB} = 200(.022 + \frac{.019}{2} - .062) \quad M_{AB} = -6.0$$

$$M_{BA} = 200(.019 + \frac{.022}{2} - .062) \quad M_{BA} = -6.4$$

Panel 2

$$M_{BC} = 134(-.003 - \frac{.005}{2} + .015) \quad M_{BC} = +1.21$$

$$M_{CB} = 134(-.005 - \frac{.003}{2} + .015) \quad M_{CB} = +1.07$$

Panel 3

$$M_{CD} = 90(-.0055 - \frac{.0098}{2} + .024) \quad M_{CD} = +1.26$$

$$M_{DC} = 90(-.0098 - \frac{.0055}{2} + .024) \quad M_{DC} = +0.99$$

Panel 4

$$M_{DE} = 95(-.0092 - \frac{.012}{2} + .026) \quad M_{DE} = +1.05$$

$$M_{ED} = 95(-.012 - \frac{.0092}{2} + .026) \quad M_{ED} = +.86$$

Panel 5

$$M_{EF} = 2.58$$

$$M_{FE} = 2.97$$

Panel 6

$$M_{FG} = 2.16$$

$$M_{GF} = 2.70$$

Panel 7

$$M_{GH} = 2.40$$

$$M_{HG} = 2.82$$

Panel 8

$$M_{HI} = 2.76$$

$$M_{IH} = 2.58$$

1. The first part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all parties involved are kept up to date.

2. The second part of the paper deals with the various methods used to collect and analyze data. It describes how the company has implemented a system of regular audits and how this has helped to identify areas where improvements can be made.

3. The third part of the paper focuses on the role of the management team in ensuring that the company's goals are met. It discusses the importance of clear communication and of setting realistic targets for each department.

4. The fourth part of the paper looks at the challenges faced by the company in the current market environment. It identifies the key areas where the company is facing difficulties and discusses the steps that are being taken to address these issues.

5. The fifth part of the paper provides a summary of the findings of the study and offers some recommendations for future action. It concludes that the company has made significant progress in recent years and that it is well positioned to continue to grow and succeed in the future.

1. The first part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all parties involved are kept up to date.

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Load at PP2

Panel 1

$$M_{AB} = 200\left(.019 + \frac{.016}{2} - .053\right) \quad M_{AB} = -5.20$$

$$M_{BA} = 200\left(.016 + \frac{.019}{2} - .053\right) \quad M_{BA} = -5.40$$

Panel 2

$$M_{BC} = 134\left(.014 + \frac{.024}{2} - .067\right) \quad M_{BC} = -5.49$$

$$M_{CB} = 134\left(.024 + \frac{.014}{2} - .067\right) \quad M_{CB} = -4.82$$

Panel 3

$$M_{CD} = 90\left(-.011 - \frac{.020}{2} + .050\right) \quad M_{CD} = +2.61$$

$$M_{DC} = 90\left(-.020 - \frac{.011}{2} + .050\right) \quad M_{DC} = +2.16$$

Panel 4

$$M_{DE} = 95\left(-.018 - \frac{.025}{2} + .052\right) \quad M_{DE} = +2.09$$

$$M_{ED} = 95\left(-.025 - \frac{.018}{2} + .052\right) \quad M_{ED} = +1.71$$

Panel 5

$$M_{EF} = 3.44$$

$$M_{FE} = 3.96$$

Panel 6

$$M_{FG} = 2.88$$

$$M_{GF} = 3.60$$

Panel 7

$$M_{GH} = 3.20$$

$$M_{HG} = 3.76$$

Panel 8

$$M_{HI} = 3.68$$

$$M_{IH} = 3.44$$

Load at PF3

Panel 1

$$M_{AB} = 200\left(.016 + \frac{.013}{2} - .044\right) \quad M_{AB} = -4.40$$

$$M_{BA} = 200\left(.013 + \frac{.016}{2} - .044\right) \quad M_{BA} = -4.60$$

Panel 2

$$M_{BC} = 134\left(.012 + \frac{.020}{2} - .057\right) \quad M_{BC} = -4.69$$

$$M_{CB} = 134\left(.020 + \frac{.012}{2} - .057\right) \quad M_{CB} = -4.15$$

Panel 3

$$M_{CD} = 90\left(.019 + \frac{.034}{2} - .086\right) \quad M_{CD} = -4.50$$

$$M_{DC} = 90\left(.034 + \frac{.019}{2} - .086\right) \quad M_{DC} = -3.78$$

Panel 4

$$M_{DE} = 95\left(-.027 - \frac{.037}{2} + .078\right) \quad M_{DE} = 3.14$$

$$M_{ED} = 95\left(-.037 - \frac{.027}{2} + .078\right) \quad M_{ED} = 2.56$$

Panel 5

$$M_{EF} = 95\left(-.012 - \frac{.0092}{2} + .026\right) \quad M_{EF} = .86$$

$$M_{FE} = 95\left(-.0092 - \frac{.012}{2} + .026\right) \quad M_{FE} = .99$$

Panel 6

$$M_{FG} = 90\left(-.0068 - \frac{.0039}{2} + .017\right) \quad M_{FG} = .72$$

$$M_{GF} = 90\left(-.0039 - \frac{.0068}{2} + .017\right) \quad M_{GF} = .90$$

Panel 7

$$M_{GH} = 134\left(-.0040 - \frac{.0023}{2} + .011\right) \quad M_{GH} = .80$$

$$M_{HG} = 134\left(-.0023 - \frac{.0040}{2} + .011\right) \quad M_{HG} = .94$$

Panel 8

$$M_{HI} = 200\left(-.0027 - \frac{.0031}{2} + .0088\right) \quad M_{HI} = .92$$

$$M_{IH} = 200\left(-.0031 - \frac{.0027}{2} + .0088\right) \quad M_{IH} = .86$$

Load at PF4

Panel 1

$$M_{AB} = 200\left(.012 + \frac{.011}{2} - .035\right)$$

$$M_{AB} = -3.40$$

$$M_{BA} = 200\left(.011 + \frac{.012}{2} - .035\right)$$

$$M_{BA} = -3.60$$

Panel 2

$$M_{BC} = 134\left(.009 + \frac{.016}{2} - .045\right)$$

$$M_{BC} = -3.75$$

$$M_{CB} = 134\left(.016 + \frac{.009}{2} - .045\right)$$

$$M_{CB} = -3.35$$

Panel 3

$$M_{CD} = 90\left(.015 + \frac{.027}{2} - .069\right)$$

$$M_{CD} = -3.69$$

$$M_{DC} = 90\left(.027 + \frac{.015}{2} - .069\right)$$

$$M_{DC} = -3.15$$

Panel 4

$$M_{DE} = 95\left(.036 + \frac{.049}{2} - 0.10\right)$$

$$M_{DE} = -3.80$$

$$M_{ED} = 95\left(.049 + \frac{.036}{2} - 0.10\right)$$

$$M_{ED} = -3.13$$

Panel 5

$$M_{EF} = 1.72$$

$$M_{FE} = 1.98$$

Panel 6

$$M_{FG} = 1.44$$

$$M_{GF} = 1.80$$

Panel 7

$$M_{GH} = 1.60$$

$$M_{HG} = 1.88$$

Panel 8

$$M_{HI} = 1.84$$

$$M_{IH} = 1.72$$

First Moment Corrections - Load at B

1 -

$$299A - 37B = 0$$

$$-52A + 400B = -1.21$$

$$A = -.00038$$

$$B = -.0031$$

$$R_1 = \frac{-2.91 \times .00038 - 2.83 \times .0031}{3.83} = -.0026$$

$$M_{AB} = 200(-.00038 - \frac{1}{2} \times .0031 + .0026) = 0.14$$

$$M_{BA} = 200(-.0031 - \frac{1}{2} \times .00038 + .0026) = -0.14$$

2 -

$$388B - 25C = 6.4$$

$$-34B + 238C = -1.26$$

$$B = .016$$

$$C = -.0030$$

$$R_2 = \frac{2.96 \times .016 - 2.91 \times .003}{3.91} = .0099$$

$$M_{BC} = 134(.016 - \frac{1}{2} \times .0030 - .0099) = 0.62$$

$$M_{CB} = 134(-.0030 + \frac{1}{2} \times .016 - .0099) = -0.66$$

3

$$271C - 17D = -1.07$$

$$-23C + 134D = -1.05$$

$$C = -.0055$$

$$D = -.0088$$

$$R_3 = \frac{-2.95 \times .0055 - 2.90 \times .0088}{3.90} = -.011$$

$$M_{CD} = 90(-.0055 - \frac{1}{2} \times .0088 + .011) = 0.072$$

$$M_{DC} = 90(-.0088 - \frac{1}{2} \times .0055 + .011) = -0.072$$

4 -

$$\begin{aligned} 94D - 24E &= -.99 \\ -24D + 135E &= -.86 \\ D &= -.013 \\ E &= -.0086 \end{aligned}$$

$$\begin{aligned} R_4 &= \frac{3}{4}(-.013 - .0086) = -.016 \\ M_{DE} &= 95(-.013 - \frac{1}{2}x.0086 + .016) = -.10 \\ M_{ED} &= 95(-.0086 - \frac{1}{2}x.013 + .016) = +.10 \end{aligned}$$

5 -

$$\begin{aligned} 135E - 24F &= -.86 \\ -24E + 94F &= -.72 \\ E &= -.0080 \\ F &= -.0097 \end{aligned}$$

$$\begin{aligned} R_5 &= \frac{3}{4}(-.0080 - .0097) = -.013 \\ M_{EF} &= 95(-.0080 - \frac{1}{2}x.0097 + .013) = .05 \\ M_{FE} &= 95(-.0097 - \frac{1}{2}x.0080 + .013) = -.04 \end{aligned}$$

6 -

$$\begin{aligned} 134F - 23G &= -.99 \\ -17F + 231G &= -.80 \\ F &= -.0079 \\ G &= -.0040 \end{aligned}$$

$$\begin{aligned} R_6 &= \frac{-2.90x.0079 - 2.95x.0040}{3.90} = -.0090 \\ M_{FG} &= 90(-.0079 - \frac{1}{2}x.0040 + .0090) = -.08 \\ M_{GF} &= 90(-.0040 - \frac{1}{2}x.0079 + .0090) = .09 \end{aligned}$$

1870-1871
1871-1872
1872-1873
1873-1874

1874-1875
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1876-1877

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1896-1897
1897-1898
1898-1899
1899-1900

7 -

$$238G - 34H = -.90$$

$$-25G + 388H = -.92$$

$$G = -.0040$$

$$H = -.0026$$

$$R_7 = \frac{-2.91 \times .0040 - 2.96 \times .0026}{3.91} = -.0049$$

$$M_{GH} = 134(-.0040 - \frac{1}{2} \times .0026 + .0049) = -.05$$

$$M_{HG} = 134(-.0026 - \frac{1}{2} \times .0040 + .0049) = .04$$

8 -

$$400H - 52I = -.94$$

$$-37H + 299I = 0.00$$

$$H = -.0024$$

$$I = -.0003$$

$$R_8 = \frac{-2.83 \times .0024 - 2.91 \times .0003}{3.83} = -.0020$$

$$M_{HI} = 200(-.0024 - \frac{1}{2} \times .0003 + .0020) = -0.10$$

$$M_{IH} = 200(-.0003 - \frac{1}{2} \times .0024 + .0020) = 0.10$$

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LIBRARY

1950

1951

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1979

Load at B

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
-Q	5.82	6.28	-1.11	-1.21	-1.10	-1.19	- .94	- .94
α	.022	.019	-.003	-.005	-.0055	-.0098	-.0092	-.012
R	.062		-.015		-.024		-.026	
M'	-6.0	-6.4	1.21	1.07	1.26	0.99	1.05	0.86
-Q	0.00	-1.21	6.4	-1.26	-1.07	-1.05	-0.99	-0.86
α	-.0004	.0031	0.16	-.0030	-.0055	-.0088	-.013	-.0086
R	-.0026		-.0099		-.011		-.016	
M''	0.14	-0.14	0.62	-0.66	0.07	-0.07	- .10	.10
-Q								
α								
R								
M'''								
M	-5.86	-6.54	1.83	0.41	1.33	0.92	0.95	0.96

Name		Address		Occupation	
John	Smith	123 Main St	New York	Merchant	
James	Johnson	456 Elm St	Chicago	Engineer	
William	Brown	789 Oak St	Philadelphia	Lawyer	
Robert	Wilson	101 Pine St	Boston	Doctor	
Thomas	Miller	202 Cedar St	San Francisco	Miner	
Charles	Davis	303 Birch St	St. Louis	Teacher	
Edward	Moore	404 Spruce St	Portland	Farmer	
George	White	505 Ash St	Richmond	Artist	
Henry	Black	606 Hickory St	Indianapolis	Writer	
Benjamin	Green	707 Walnut St	Cincinnati	Banker	
Samuel	Adams	808 Chestnut St	Pittsburgh	Shipper	
Joseph	Nelson	909 Elm St	Albany	Editor	
Samuel	Phillips	1010 Main St	Providence	Manufacturer	
John	Wright	1111 Oak St	Omaha	Merchant	
James	Scott	1212 Pine St	St. Paul	Engineer	
William	Walker	1313 Cedar St	San Jose	Farmer	
Robert	Young	1414 Birch St	San Diego	Merchant	
Thomas	Allen	1515 Spruce St	San Antonio	Engineer	
Charles	King	1616 Ash St	San Marcos	Teacher	
Edward	Wells	1717 Hickory St	San Luis Obispo	Farmer	
George	Ward	1818 Walnut St	San Bernardino	Merchant	
Henry	Gray	1919 Chestnut St	San Gabriel	Engineer	
Benjamin	Wheeler	2020 Elm St	San Jose	Farmer	
Samuel	Clark	2121 Main St	San Francisco	Merchant	
Joseph	Stevens	2222 Oak St	San Jose	Engineer	
Samuel	Turner	2323 Pine St	San Francisco	Merchant	
John	Phillips	2424 Cedar St	San Francisco	Engineer	
James	Wright	2525 Birch St	San Francisco	Farmer	
William	Scott	2626 Spruce St	San Francisco	Merchant	
Robert	Walker	2727 Ash St	San Francisco	Engineer	
Thomas	Allen	2828 Hickory St	San Francisco	Farmer	
Charles	King	2929 Walnut St	San Francisco	Merchant	
Edward	Wells	3030 Chestnut St	San Francisco	Engineer	
George	Ward	3131 Elm St	San Francisco	Farmer	
Henry	Gray	3232 Main St	San Francisco	Merchant	
Benjamin	Wheeler	3333 Oak St	San Francisco	Engineer	
Samuel	Clark	3434 Pine St	San Francisco	Farmer	
Joseph	Stevens	3535 Cedar St	San Francisco	Merchant	
Samuel	Turner	3636 Birch St	San Francisco	Engineer	
John	Phillips	3737 Spruce St	San Francisco	Farmer	
James	Wright	3838 Ash St	San Francisco	Merchant	
William	Scott	3939 Hickory St	San Francisco	Engineer	
Robert	Walker	4040 Walnut St	San Francisco	Farmer	
Thomas	Allen	4141 Chestnut St	San Francisco	Merchant	
Charles	King	4242 Elm St	San Francisco	Engineer	
Edward	Wells	4343 Main St	San Francisco	Farmer	
George	Ward	4444 Oak St	San Francisco	Merchant	
Henry	Gray	4545 Pine St	San Francisco	Engineer	
Benjamin	Wheeler	4646 Cedar St	San Francisco	Farmer	
Samuel	Clark	4747 Birch St	San Francisco	Merchant	
Joseph	Stevens	4848 Spruce St	San Francisco	Engineer	
Samuel	Turner	4949 Ash St	San Francisco	Farmer	
John	Phillips	5050 Hickory St	San Francisco	Merchant	
James	Wright	5151 Walnut St	San Francisco	Engineer	
William	Scott	5252 Chestnut St	San Francisco	Farmer	
Robert	Walker	5353 Elm St	San Francisco	Merchant	
Thomas	Allen	5454 Main St	San Francisco	Engineer	
Charles	King	5555 Oak St	San Francisco	Farmer	
Edward	Wells	5656 Pine St	San Francisco	Merchant	
George	Ward	5757 Cedar St	San Francisco	Engineer	
Henry	Gray	5858 Birch St	San Francisco	Farmer	
Benjamin	Wheeler	5959 Spruce St	San Francisco	Merchant	
Samuel	Clark	6060 Ash St	San Francisco	Engineer	
Joseph	Stevens	6161 Hickory St	San Francisco	Farmer	
Samuel	Turner	6262 Walnut St	San Francisco	Merchant	
John	Phillips	6363 Chestnut St	San Francisco	Engineer	
James	Wright	6464 Elm St	San Francisco	Farmer	
William	Scott	6565 Main St	San Francisco	Merchant	
Robert	Walker	6666 Oak St	San Francisco	Engineer	
Thomas	Allen	6767 Pine St	San Francisco	Farmer	
Charles	King	6868 Cedar St	San Francisco	Merchant	
Edward	Wells	6969 Birch St	San Francisco	Engineer	
George	Ward	7070 Spruce St	San Francisco	Farmer	
Henry	Gray	7171 Ash St	San Francisco	Merchant	
Benjamin	Wheeler	7272 Hickory St	San Francisco	Engineer	
Samuel	Clark	7373 Walnut St	San Francisco	Farmer	
Joseph	Stevens	7474 Chestnut St	San Francisco	Merchant	
Samuel	Turner	7575 Elm St	San Francisco	Engineer	
John	Phillips	7676 Main St	San Francisco	Farmer	
James	Wright	7777 Oak St	San Francisco	Merchant	
William	Scott	7878 Pine St	San Francisco	Engineer	
Robert	Walker	7979 Cedar St	San Francisco	Farmer	
Thomas	Allen	8080 Birch St	San Francisco	Merchant	
Charles	King	8181 Spruce St	San Francisco	Engineer	
Edward	Wells	8282 Ash St	San Francisco	Farmer	
George	Ward	8383 Hickory St	San Francisco	Merchant	
Henry	Gray	8484 Walnut St	San Francisco	Engineer	
Benjamin	Wheeler	8585 Chestnut St	San Francisco	Farmer	
Samuel	Clark	8686 Elm St	San Francisco	Merchant	
Joseph	Stevens	8787 Main St	San Francisco	Engineer	
Samuel	Turner	8888 Oak St	San Francisco	Farmer	
John	Phillips	8989 Pine St	San Francisco	Merchant	
James	Wright	9090 Cedar St	San Francisco	Engineer	
William	Scott	9191 Birch St	San Francisco	Farmer	
Robert	Walker	9292 Spruce St	San Francisco	Merchant	
Thomas	Allen	9393 Ash St	San Francisco	Engineer	
Charles	King	9494 Hickory St	San Francisco	Farmer	
Edward	Wells	9595 Walnut St	San Francisco	Merchant	
George	Ward	9696 Chestnut St	San Francisco	Engineer	
Henry	Gray	9797 Elm St	San Francisco	Farmer	
Benjamin	Wheeler	9898 Main St	San Francisco	Merchant	
Samuel	Clark	9999 Oak St	San Francisco	Engineer	

5		6		7		8	
E	F	F	G	G	H	H	I
-0.94	-0.94	-0.82	-0.76	-0.87	-0.81	-0.90	-0.83
-0.12	-.0092	-.0068	-.0039	-.0040	-.0023	-.0027	-.0031
-.026		-.017		-.011		-.0088	
0.86	0.99	0.72	0.90	0.80	0.94	0.92	0.86
-0.86	-0.72	-0.99	-0.80	-0.90	-0.92	-0.94	0.00
-.0080	-.0097	-.0079	-.0040	-.0040	-.0026	-.0024	-.0003
-.013		-.0090		-.0049		-.0020	
.05	-.04	-.08	.09	-.05	.04	-.10	.10
0.91	0.95	0.64	0.99	0.75	0.98	0.82	0.96

First Moment Corrections - Load at C

$$1. \quad \begin{aligned} 299A - 37B &= 0 \\ -52A + 400B &= 5.49' \end{aligned}$$

$$\begin{aligned} A &= .0017 \\ B &= .014 \\ R_1 &= \frac{2.91 \times .0017 + 2.83 \times .014}{3.83} = .012 \end{aligned}$$

$$\begin{aligned} M_{AB} &= 200(.0017 + \frac{1}{2} \times .014 - .012) = -.60 \\ M_{BA} &= 200(.014 + \frac{1}{2} \times .0017 - .012) = .60 \end{aligned}$$

$$2. \quad \begin{aligned} 388B - 25C &= 5.40 \\ -34B + 238C &= -2.61 \end{aligned}$$

$$\begin{aligned} B &= .013 \\ C &= -.0091 \\ R_2 &= \frac{2.96 \times .013 - 2.91 \times .0091}{3.91} = .0031 \end{aligned}$$

$$\begin{aligned} M_{BC} &= 134(.013 - \frac{1}{2} \times .0091 - .0031) = .67 \\ M_{CB} &= 134(-.0091 + \frac{1}{2} \times .013 - .0031) = -.71 \end{aligned}$$

$$3. \quad \begin{aligned} 231C - 17D &= 4.82 \\ -23C + 134D &= -2.09 \end{aligned}$$

$$\begin{aligned} C &= .020 \\ D &= .012 \\ R_3 &= \frac{2.95 \times .02 - 2.90 \times .012}{3.90} = .0062 \end{aligned}$$

$$\begin{aligned} M_{CD} &= 90(.020 - \frac{1}{2} \times .012 - .0062) = .72 \\ M_{DC} &= 90(-.012 + \frac{1}{2} \times .020 - .0062) = -.72 \end{aligned}$$

$$4. \quad \begin{aligned} 94D - 24E &= -2.16 \\ -24D + 135E &= -1.72 \end{aligned}$$

$$\begin{aligned} D &= -.028 \\ E &= .018 \\ R_4 &= \frac{3}{4} (-.028 - .018) = -.035 \\ M_{DE} &= 95(-.028 - \frac{1}{2} \times .018 + .035) = -.23 \\ M_{ED} &= 95(-.018 - \frac{1}{2} \times .028 + .035) = .23 \end{aligned}$$

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

RESEARCH REPORT

NO. 100

1950

BY

JOHN D. COLEMAN

AND

ROBERT H. FERRY

PHYSICS DEPARTMENT

UNIVERSITY OF CHICAGO

CHICAGO, ILL.

1950

RESEARCH REPORT

NO. 100

5.

$$\begin{aligned}
 135E - 24F &= -1.71 \\
 -24E + 94F &= -1.44 \\
 E &= -.016 \\
 F &= -.019
 \end{aligned}$$

$$R_5 = \frac{3}{4} (-.016 - .019) = -.026$$

$$M_{EF} = 95(-.016 - \frac{1}{2} \times .019 + .026) = .10$$

$$M_{FE} = 95(-.016 - \frac{1}{2} \times .019 + .026) = -.10$$

6.

$$\begin{aligned}
 134F - 23G &= -1.98 \\
 -17F + 231G &= -1.60 \\
 F &= -.016 \\
 G &= -.008
 \end{aligned}$$

$$R_6 = \frac{-2.90 \times .008 - 2.95 \times .016}{3.90} = -.018$$

$$M_{FG} = 90(-.016 - \frac{1}{2} \times .008 + .018) = -.18$$

$$M_{GF} = 90(-.008 - \frac{1}{2} \times .016 + .018) = .18$$

7.

$$\begin{aligned}
 238G - 34H &= -1.80 \\
 -25G + 388H &= -1.84 \\
 G &= .0080 \\
 H &= .0052
 \end{aligned}$$

$$R_7 = \frac{-2.91 \times .0080 - 2.96 \times .0052}{3.91} = -.0098$$

$$M_{GH} = 134(-.0080 - \frac{1}{2} \times .0052 + .0098) = -.09$$

$$M_{HG} = 134(-.0080 - \frac{1}{2} \times .0052 + .0098) = .09$$

8.

$$\begin{aligned}
 400H - 52I &= -1.88 \\
 -37H + 299I &= 0 \\
 H &= -.0049 \\
 I &= -.0006
 \end{aligned}$$

$$R_8 = \frac{-2.83 \times .0049 - 2.91 \times .0006}{3.83} = -.0040$$

$$M_{HI} = 200(-.0049 - \frac{1}{2} \times .0006 + .0040) = -.20$$

$$M_{IH} = 200(-.0006 - \frac{1}{2} \times .0049 + .0040) = .20$$

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Second Moment Corrections-Load at C

1.

$$\begin{aligned} 299A - 37B &= 0 \\ -52A + 400B &= -.67 \\ A &= -.0002 \\ B &= -.0017 \end{aligned}$$

$$R_1 = \frac{-2.91 \times .0002 - 2.83 \times .0017}{3.83} = -.0014$$

$$M_{AB} = 200(-.0002 - \frac{1}{2} \times .0017 + .0014) = .08$$

$$M_{BA} = 200(-.0017 - \frac{1}{2} \times .0002 + .0014) = -.08$$

2.

$$\begin{aligned} 388B - 25C &= -.67 \\ -34B + 238C &= -.72 \\ B &= -.0020 \\ C &= -.0033 \end{aligned}$$

$$R_2 = \frac{-2.96 \times .0020 - 2.91 \times .0033}{3.91} = -.0040$$

$$M_{BC} = 134(-.0020 - \frac{1}{2} \times .0033 + .0040) = .05$$

$$M_{CB} = 134(-.0033 - \frac{1}{2} \times .0020 + .0040) = -.04$$

3.

$$\begin{aligned} 231C - 17D &= .71 \\ -23C + 134D &= .23 \\ C &= .0023 \\ D &= .0033 \end{aligned}$$

$$R_3 = \frac{2.95 \times .0023 + 2.90 \times .0033}{3.90} = .0042$$

$$M_{CD} = 90(.0023 + \frac{1}{2} \times .0033 - .0042) = -.03$$

$$M_{DC} = 90(.0033 + \frac{1}{2} \times .0023 - .0042) = .03$$

4.

$$\begin{aligned} 94D - 24E &= .72 \\ -24D + 135E &= -.10 \\ D &= .0076 \\ E &= .0006 \end{aligned}$$

$$R_4 = \frac{3}{4} (.0076 + .0006) = .0062$$

$$M_{DE} = 95(.0076 + \frac{1}{2} \times .0006 - .0062) = .16$$

$$M_{ED} = 95(.0006 + \frac{1}{2} \times .0076 - .0062) = -.16$$

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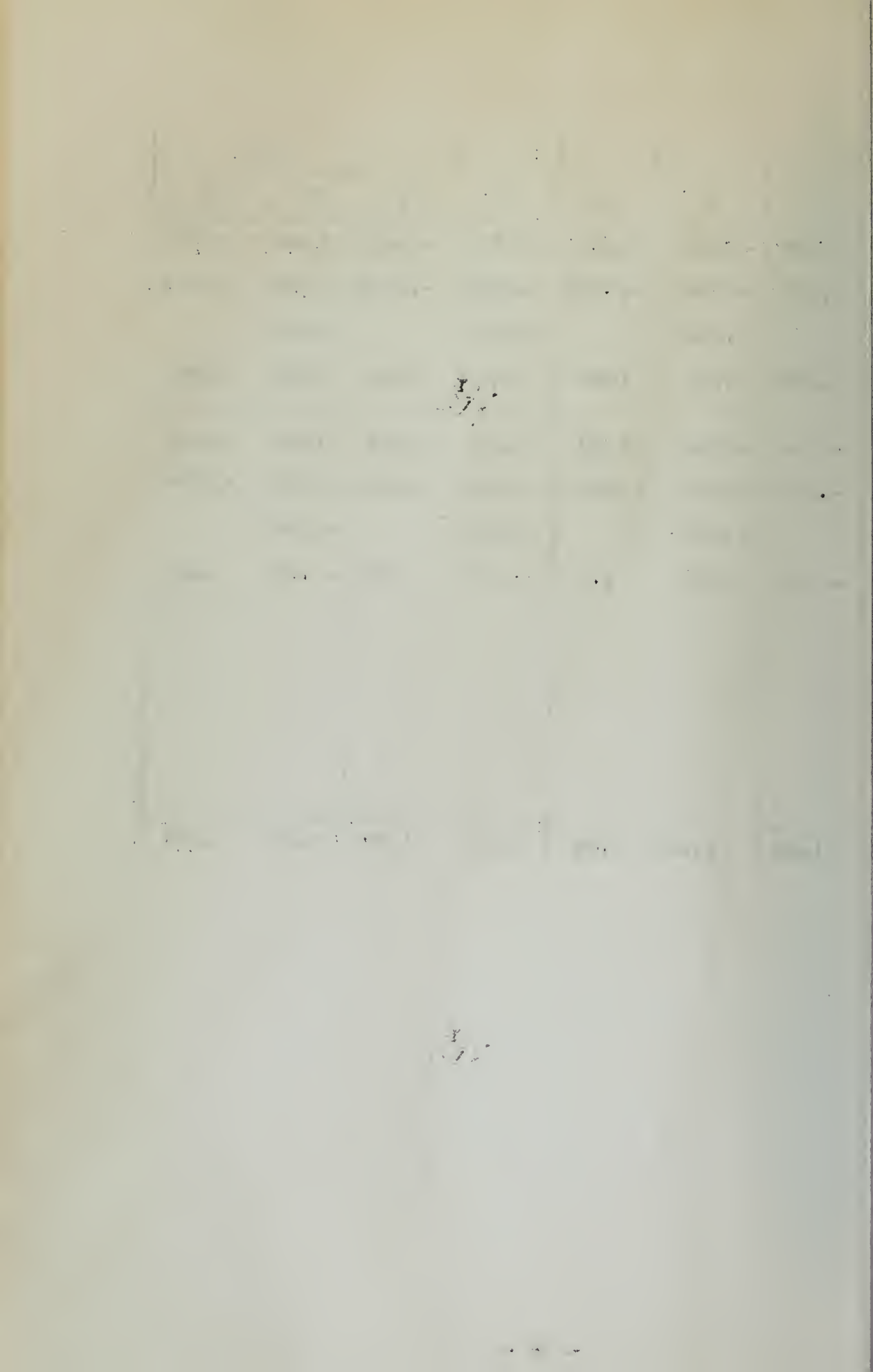
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Load at C

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
Q	4.98	5.38	4.82	5.24	-2.20	-2.39	-1.87	-1.87
X	.019	.016	.014	.024	-.011	-.020	-.018	-.025
R	.053		.067		-.050		-.052	
M'	-5.20	-5.40	-5.49	-4.82	2.61	2.16	2.09	1.71
Q	0.00	5.49	5.40	-2.61	4.82	-2.09	-2.16	-1.72
X	.0017	.014	.013	-.0091	.020	-0.12	-0.28	-.018
R	.012		-.0031		.0062		-.035	
M''	-.60	.60	.67	-.71	.72	-.72	-.23	.23
Q	0.00	-.67	-.67	-.72	.71	.23	.72	-.10
X	-.0002	-.0017	-.0020	-.0033	.0023	.0033	.0076	.0006
R	-.0014		-.0040		.0042		.0062	
M'''	.08	-.08	.05	-.04	-.03	.03	.16	-.16
M	-5.72	-4.88	-4.77	-5.57	3.29	1.47	2.02	1.78

Jan 1	1887	Jan 1	1887	Jan 1	1887	Jan 1	1887
Jan 2	1887	Jan 2	1887	Jan 2	1887	Jan 2	1887
Jan 3	1887	Jan 3	1887	Jan 3	1887	Jan 3	1887
Jan 4	1887	Jan 4	1887	Jan 4	1887	Jan 4	1887
Jan 5	1887	Jan 5	1887	Jan 5	1887	Jan 5	1887
Jan 6	1887	Jan 6	1887	Jan 6	1887	Jan 6	1887
Jan 7	1887	Jan 7	1887	Jan 7	1887	Jan 7	1887
Jan 8	1887	Jan 8	1887	Jan 8	1887	Jan 8	1887
Jan 9	1887	Jan 9	1887	Jan 9	1887	Jan 9	1887
Jan 10	1887	Jan 10	1887	Jan 10	1887	Jan 10	1887
Jan 11	1887	Jan 11	1887	Jan 11	1887	Jan 11	1887
Jan 12	1887	Jan 12	1887	Jan 12	1887	Jan 12	1887
Jan 13	1887	Jan 13	1887	Jan 13	1887	Jan 13	1887
Jan 14	1887	Jan 14	1887	Jan 14	1887	Jan 14	1887
Jan 15	1887	Jan 15	1887	Jan 15	1887	Jan 15	1887
Jan 16	1887	Jan 16	1887	Jan 16	1887	Jan 16	1887
Jan 17	1887	Jan 17	1887	Jan 17	1887	Jan 17	1887
Jan 18	1887	Jan 18	1887	Jan 18	1887	Jan 18	1887
Jan 19	1887	Jan 19	1887	Jan 19	1887	Jan 19	1887
Jan 20	1887	Jan 20	1887	Jan 20	1887	Jan 20	1887
Jan 21	1887	Jan 21	1887	Jan 21	1887	Jan 21	1887
Jan 22	1887	Jan 22	1887	Jan 22	1887	Jan 22	1887
Jan 23	1887	Jan 23	1887	Jan 23	1887	Jan 23	1887
Jan 24	1887	Jan 24	1887	Jan 24	1887	Jan 24	1887
Jan 25	1887	Jan 25	1887	Jan 25	1887	Jan 25	1887
Jan 26	1887	Jan 26	1887	Jan 26	1887	Jan 26	1887
Jan 27	1887	Jan 27	1887	Jan 27	1887	Jan 27	1887
Jan 28	1887	Jan 28	1887	Jan 28	1887	Jan 28	1887
Jan 29	1887	Jan 29	1887	Jan 29	1887	Jan 29	1887
Jan 30	1887	Jan 30	1887	Jan 30	1887	Jan 30	1887
Jan 31	1887	Jan 31	1887	Jan 31	1887	Jan 31	1887

5		6		7		8	
E	F	F	G	G	H	H	I
-1.88	-1.88	-1.64	-1.52	-1.74	-1.62	-1.80	-1.66
-.024	-.018	-.014	-.0078	-.0080	-.0046	-.0054	-.0062
-.052		-.034		-.022		-.018	
1.72	1.98	1.44	1.80	1.60	1.88	1.84	1.72
-1.71	-1.44	-1.98	-1.60	-1.80	-1.84	-1.88	0.00
-.016	-.019	-.016	-.008	-.0080	-.0052	-.0049	-.0006
-.026		-.018		-.0098		-.0042	
.10	- .10	- .18	.18	- .09	.09	- .20	.20
1.82	1.88	1.26	1.98	1.51	1.97	1.64	1.92



Influence Lines - First Correction

Load at D

Panel 1

$$299A - 37B = 0$$

$$-52A + 400B = 4.69$$

$$A = .001$$

$$B = .012$$

$$R_1 = .010$$

$$M_{AB} = 200(.001 + \frac{1}{2}x.012 - .01) = -.60$$

$$M_{BA} = 200(.012 + \frac{1}{2}x.001 - .01) = .60$$

Panel 2

$$389B - 25C = 4.60$$

$$-34B + 238C = 4.50$$

$$B = .013$$

$$C = .021$$

$$R_2 = .025$$

$$M_{BC} = 134(.013 + \frac{1}{2}x.021 - .025) = -.27$$

$$M_{CB} = 134(.021 + \frac{1}{2}x.013 - .025) = .27$$

Panel 3

$$231C - 17D = 4.15$$

$$-23C + 134D = -3.14$$

$$C = .016$$

$$D = -.021$$

$$R_3 = -.003$$

$$M_{CD} = 90(.016 - \frac{1}{2}x.021 + .003) = .81$$

$$M_{DC} = 90(-.021 + \frac{1}{2}x.016 + .003) = -.90$$

Panel 4

$$135D - 24E = 3.78$$

$$-24D + 94E = -2.58$$

$$D = .024$$

$$E = -.021$$

$$R_4 = .002$$

$$M_{DE} = 95(.024 - \frac{1}{2}x.021 - .002) = 1.14$$

$$M_{ED} = 95(-.021 + \frac{1}{2}x.024 - .002) = -1.04$$

1870-1871

1870-1871

1870-1871

1870-1871

1870-1871

Panel 5

$$-24F + 94E = -2.56$$

$$135F - 24E = -2.16$$

$$E = -.033$$

$$F = -.022$$

$$R_5 = -.041$$

$$M_{EF} = 95(-.033 - \frac{1}{2}x.022 + .041) = -.28$$

$$M_{FE} = 95(-.022 - \frac{1}{2}x.033 + .041) = .28$$

Panel 6

$$-23G + 134F = -2.97$$

$$231G - 17F = -2.40$$

$$F = -.024$$

$$G = -.012$$

$$R_6 = -.027$$

$$M_{FG} = 90(-.024 - \frac{1}{2}x.012 + .027) = -.27$$

$$M_{GF} = 90(-.012 - \frac{1}{2}x.024 + .027) = .27$$

Panel 7

$$-34H + 238G = -2.70$$

$$389H - 25G = -2.76$$

$$G = -.012$$

$$H = -.008$$

$$R_7 = -.015$$

$$M_{GH} = 134(-.012 - \frac{1}{2}x.008 + .015) = -.13$$

$$M_{HG} = 134(-.008 - \frac{1}{2}x.012 + .015) = .13$$

Panel 8

$$-52I + 400H = -2.82$$

$$299I - 37H = 0$$

$$H = -.001$$

$$I = -.007$$

$$R_8 = -.005$$

$$M_{HI} = 200(0 - \frac{1}{2}x.007 + .005) = .40$$

$$M_{IH} = 200(-.007 - \frac{1}{2}x0 + .005) = -.40$$

1. $\sigma_1 = 1$

2. $\sigma_2 = 1$

3. $\sigma_3 = 1$

4. $\sigma_4 = 1$

5. $\sigma_5 = 1$

6. $\sigma_6 = 1$

7. $\sigma_7 = 1$

8. $\sigma_8 = 1$

9. $\sigma_9 = 1$

10. $\sigma_{10} = 1$

11. $\sigma_{11} = 1$

12. $\sigma_{12} = 1$

13. $\sigma_{13} = 1$

14. $\sigma_{14} = 1$

15. $\sigma_{15} = 1$

16. $\sigma_{16} = 1$

17. $\sigma_{17} = 1$

18. $\sigma_{18} = 1$

19. $\sigma_{19} = 1$

20. $\sigma_{20} = 1$

21. $\sigma_{21} = 1$

22. $\sigma_{22} = 1$

23. $\sigma_{23} = 1$

24. $\sigma_{24} = 1$

25. $\sigma_{25} = 1$

26. $\sigma_{26} = 1$

27. $\sigma_{27} = 1$

28. $\sigma_{28} = 1$

29. $\sigma_{29} = 1$

30. $\sigma_{30} = 1$

Influence Lines - Second Correction - Load at D

Panel 1

$$299A - 37B = 0$$

$$-53A + 400B = .27$$

$$A = 0$$

$$B = .0007$$

$$R_1 = 0$$

$$M_{AB} = 0$$

$$M_{BA} = 0$$

Panel 2

$$389B - 25C = -.60$$

$$-34B + 238C = -.81$$

$$B = -.0018$$

$$C = -.0037$$

$$R_2 = -.0041$$

$$M_{BC} = 134(-.0018 - \frac{1}{2}x.0037 + .0041) = .07$$

$$M_{CB} = 134(-.0037 - \frac{1}{2}x.0018 + .0041) = -.07$$

Panel 3

$$231C - 17D = -.27$$

$$-.23C + 134D = -1.14$$

$$C = -.0019$$

$$D = -.0088$$

$$R_3 = -.0080$$

$$M_{CD} = 90(-.0019 - \frac{1}{2}x.0088 + .0080) = .15$$

$$M_{DC} = 90(-.0088 - \frac{1}{2}x.0019 + .0080) = -.15$$

Panel 4

$$135D - 24E = .90$$

$$-24D + 94E = .28$$

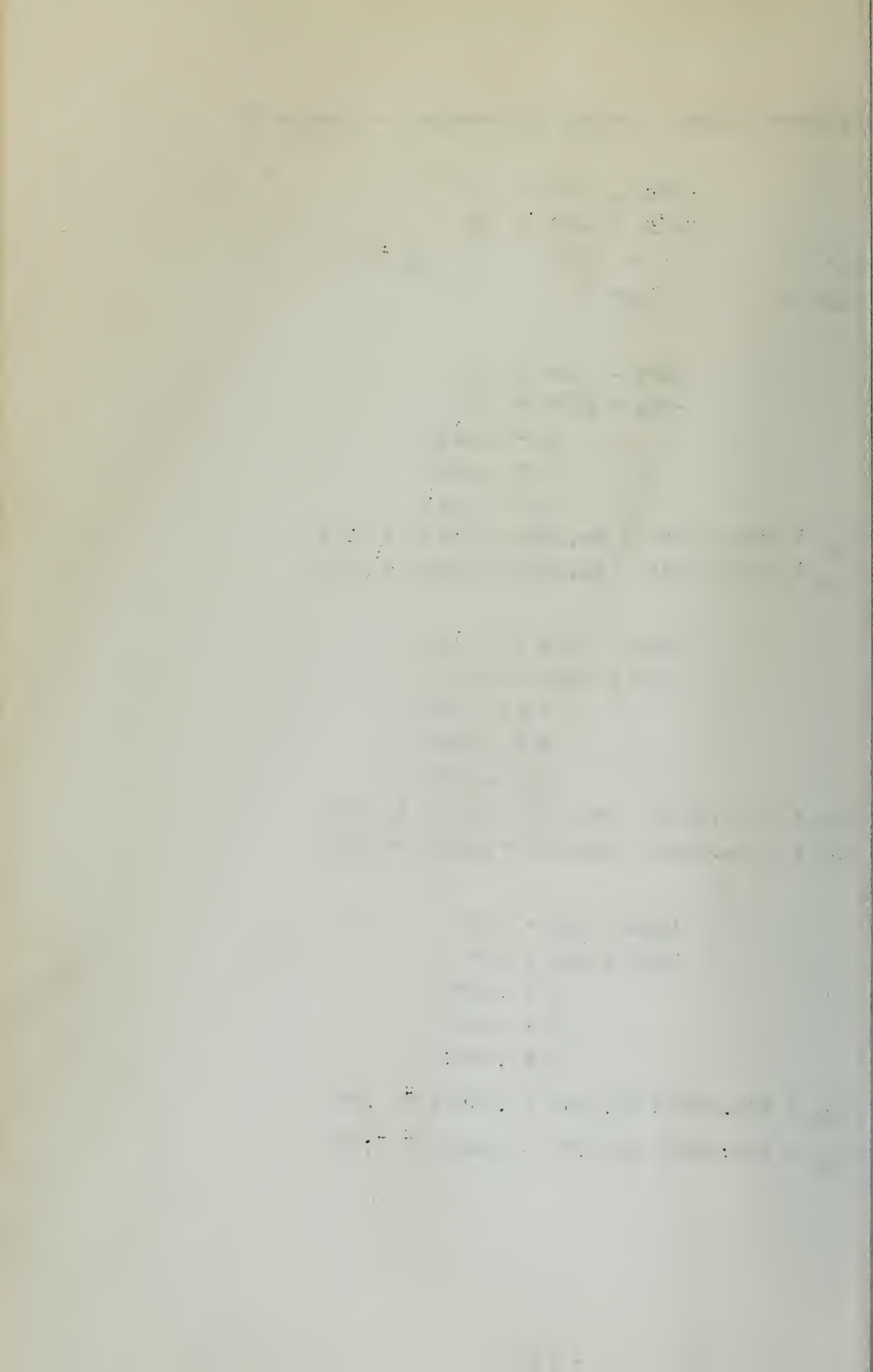
$$D = .0076$$

$$E = .0049$$

$$R_4 = .0094$$

$$M_{DE} = 95(.0076 + \frac{1}{2}x.0049 - .0094) = .07$$

$$M_{ED} = 95(.0049 + \frac{1}{2}x.0076 - .0094) = -.07$$



Panel 5

$$-24F + 94E = 1.04$$

$$135F - 24E = .27$$

$$E = .0121$$

$$F = .0042$$

$$R_5 = .0122$$

$$M_{EF} = 95(.0121 + \frac{1}{2}x.0042 - .0122) = .19$$

$$M_{FE} = 95(.0042 + \frac{1}{2}x.0121 - .0122) = -.19$$

Panel 6

$$-23G + 134F = -.28$$

$$231G - 17F = .13$$

$$F = -.0020$$

$$G = .0004$$

$$R_6 = -.0012$$

$$M_{FG} = 90(-.0020 + \frac{1}{2}x.0004 + .0012) = -.05$$

$$M_{GF} = 90(.0004 - \frac{1}{2}x.0020 + .0012) = .05$$

Panel 7

$$-34H + 238G = -.27$$

$$389H - 25G = -.40$$

$$G = -.0013$$

$$H = -.0011$$

$$R_7 = -.0018$$

$$M_{GH} = 134(-.0013 - \frac{1}{2}x.0011 + .0018) = 0$$

$$M_{HG} = 134(-.0011 - \frac{1}{2}x.0013 + .0018) = 0$$

Panel 8

$$-52I + 400H = -.13$$

$$299I - 37H = 0$$

$$H = -.0003$$

$$R_8 = 0$$

$$M_{IH} = 0$$

$$I = 0$$

$$M_{HI} = 0$$

1. $\frac{1}{2} \log 2$
 2. $\frac{1}{2} \log 2$
 3. $\frac{1}{2} \log 2$
 4. $\frac{1}{2} \log 2$
 5. $\frac{1}{2} \log 2$

6. $\frac{1}{2} \log 2$
 7. $\frac{1}{2} \log 2$

8. $\frac{1}{2} \log 2$
 9. $\frac{1}{2} \log 2$
 10. $\frac{1}{2} \log 2$
 11. $\frac{1}{2} \log 2$
 12. $\frac{1}{2} \log 2$

13. $\frac{1}{2} \log 2$
 14. $\frac{1}{2} \log 2$

15. $\frac{1}{2} \log 2$
 16. $\frac{1}{2} \log 2$
 17. $\frac{1}{2} \log 2$
 18. $\frac{1}{2} \log 2$
 19. $\frac{1}{2} \log 2$

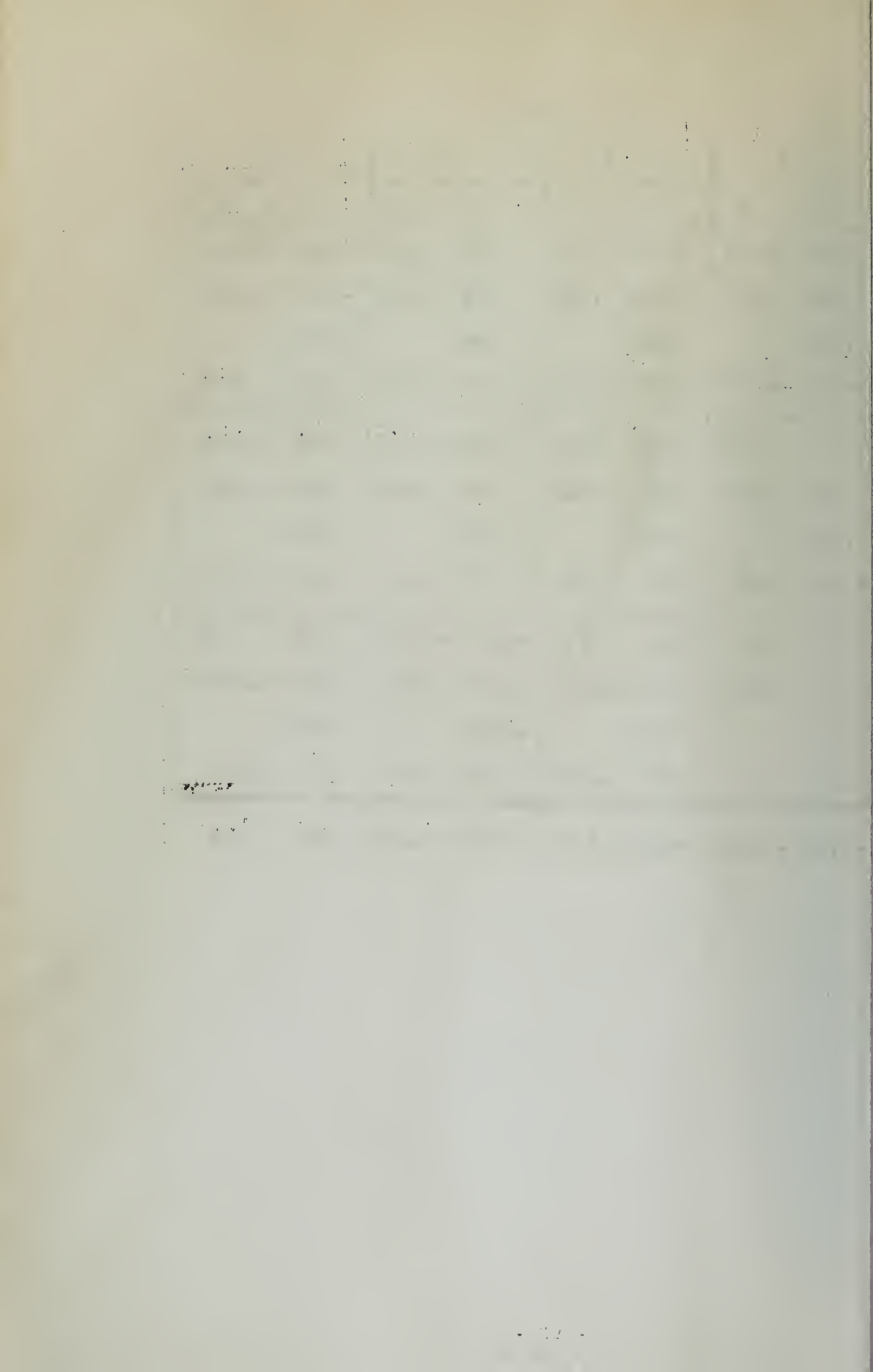
20. $\frac{1}{2} \log 2$
 21. $\frac{1}{2} \log 2$

22. $\frac{1}{2} \log 2$
 23. $\frac{1}{2} \log 2$

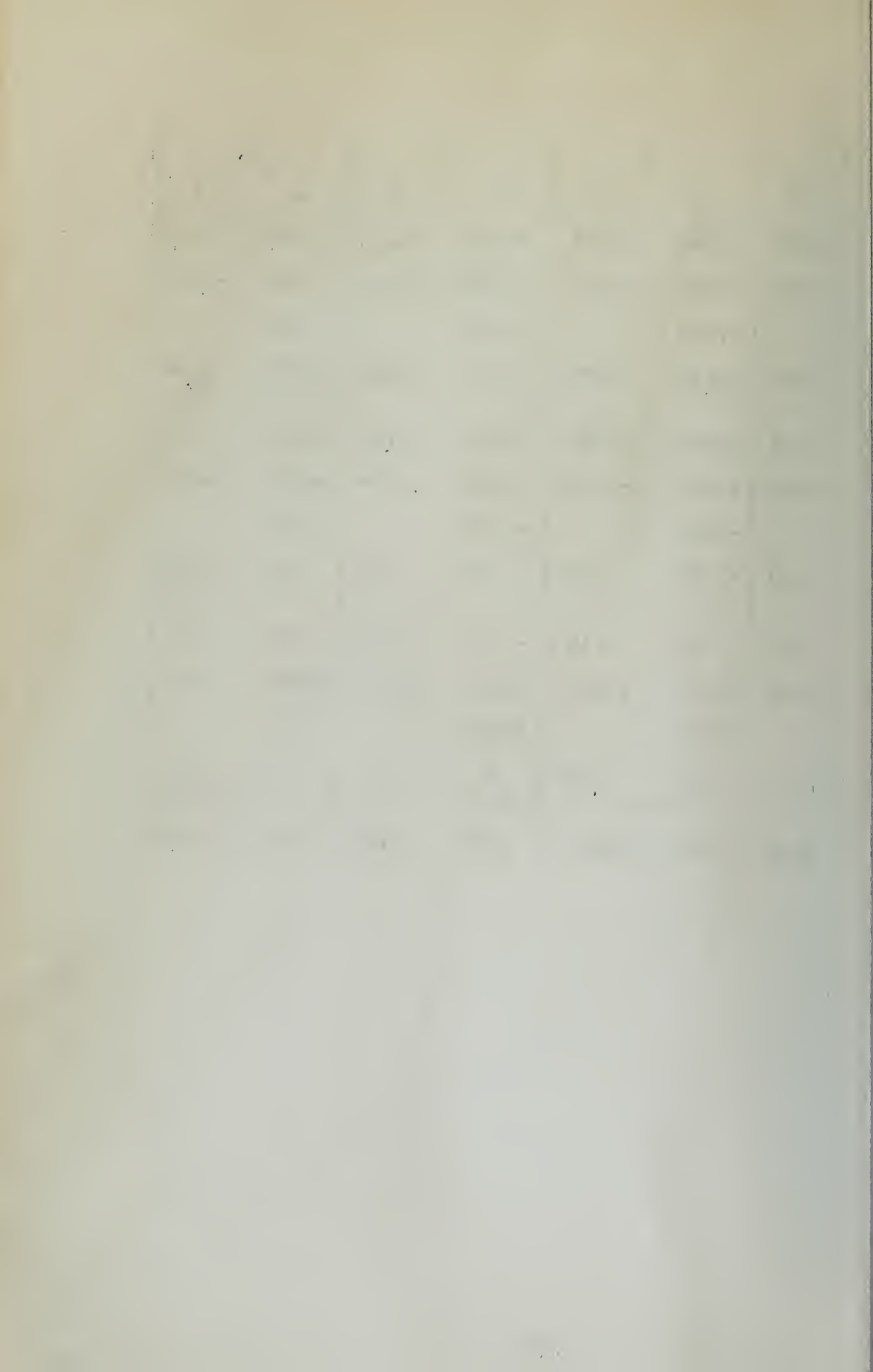
24. $\frac{1}{2} \log 2$
 25. $\frac{1}{2} \log 2$

Load at PP3

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
-Q	4.15	4.49	4.02	4.36	3.80	4.12	-2.88	-2.81
α	.016	.013	.012	.020	.019	.034	-.027	-.037
R	.044		.057		.086		-.078	
M'	-4.40	-4.60	-4.69	-4.15	-4.50	-3.78	3.14	2.56
-Q	0	4.69	4.60	4.50	4.15	-3.14	3.78	-2.58
α	.001	.012	.031	.021	.016	-.021	.024	-.021
R	.010		.025		-.003		.002	
M''	-.60	.60	-.27	.27	.81	-.90	1.14	-1.04
-Q	0	.27	-.60	-.81	-.27	-1.14	.90	.28
α	0	.0007	-.0018	-.0037	-.0019	-.0083	.0076	.0049
R	0		-.0041		-.0080		.0094	
M'''	0	0	.07	-.07	.15	-.15	.07	-.07
M	-5.00	-4.00	-4.89	-3.95	-3.54	-4.83	4.35	1.45



5		6		7		8	
E	F	F	G	G	H	H	I
-2.82	-2.82	-2.46	-2.28	-2.61	-2.43	-2.70	-2.49
-.036	-.028	-.020	-.012	-.012	-.007	-.008	-.009
-.078		-.051		-.033		-.026	
2.58	2.97	2.16	2.70	2.40	2.82	2.76	2.58
-2.56	-2.16	-2.97	-2.40	-2.70	-2.76	-2.82	0
-.035	-.022	-.024	-.012	-.012	-.008	-.001	-.007
-.041		-.027		-.015		-.005	
-.26	.23	-.27	.27	-.13	.13	.40	-.40
1.04	.27	-.28	.13	-.27	-.40	-.13	0
.0121	.0042	-.0020	.0004	-.0013	-.0011	-.0003	0
.0122		-.0012		-.0018		0	
.19	-.19	-.05	.05	0	0	0	0
2.49	3.06	1.84	3.02	2.27	2.95	3.16	2.18



Influence Lines First Correction Load at E

Panel 1, 8

$$299A - 37B = 0$$

$$-52A + 100B = 3.76$$

$$A = .0012$$

$$B = .0095$$

$$R_1 = .0079$$

$$M_{AB} = 200(.0012 + \frac{1}{2} \times .0095 - .0079) = -.40$$

$$M_{BA} = 200(.0095 + \frac{1}{2} \times .0012 - .0079) = .40$$

Panel 2, 7

$$389B - 25C = -.21$$

$$-34B + 238C = 3.60$$

$$B = .0105$$

$$C = .0172$$

$$R_2 = .208$$

$$M_{EC} = 134(.0105 + \frac{1}{2} \times .0172 - .0208) = -.21$$

$$M_{CE} = 134(.0172 + \frac{1}{2} \times .0105 - .0208) = .21$$

Panel 3, 6

$$231C - 17D = 3.20$$

$$-23C + 134D = 3.96$$

$$C = .0162$$

$$D = .0324$$

$$R_3 = .0364$$

$$M_{CD} = 90(.0162 + \frac{1}{2} \times .0324 - .0362) = -.36$$

$$M_{DC} = 90(.0324 + \frac{1}{2} \times .0162 - .0362) = .36$$

Panel 4, 5

$$135D - 24E = 2.88$$

$$-24D + 94E = -3.44$$

$$D = .0155$$

$$E = -.0326$$

$$R_4 = -.0128$$

$$M_{DE} = 95(.0155 - \frac{1}{2} \times .0326 + .0128) = 1.14$$

$$M_{ED} = 95(-.0326 - \frac{1}{2} \times .0155 + .0128) = -1.14$$

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Influence Lines - Second Correction - Load at E

Panel 1,8

$$299A - 37B = 0$$

$$-52A + 400B = .21$$

$$A = .00007$$

$$B = .00053$$

$$R_1 = .00044$$

$$M_{AB} = 200(.00007 + \frac{1}{2}x.00053 - .00044) = -.02$$

$$M_{BA} = 200(.00053 + \frac{1}{2}x.00007 - .00044) = .02$$

Panel 2,7

$$389B - 25C = -.40$$

$$-34B + 238C = .36$$

$$B = -.00094$$

$$C = .00132$$

$$R_2 = .00027$$

$$M_{BC} = 134(-.00094 + \frac{1}{2}x.00132 - .00027) = -.08$$

$$M_{CB} = 134(.00132 - \frac{1}{2}x.00094 - .00027) = .08$$

Panel 3,6

$$231C - 17D = -.21$$

$$-23C + 134D = -1.14$$

$$C = -.0016$$

$$D = -.0088$$

$$R_3 = -.0077$$

$$M_{CD} = 90(-.0016 - \frac{1}{2}x.0088 + .0077) = .16$$

$$M_{DC} = 90(-.0088 - \frac{1}{2}x.0016 + .0077) = -.16$$

Panel 4,5

$$135D - 24E = -.21$$

$$-24D + 94E = 0$$

$$D = -.0016$$

$$E = -.0004$$

$$R_4 = -.0015$$

$$M_{DE} = 95(-.0016 - \frac{1}{2}x.0004 + .0015) = -.03$$

$$M_{ED} = 95(-.0004 - \frac{1}{2}x.0016 + .0015) = .03$$

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Load at PP-4

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
-Q	3.32	3.59	3.22	3.49	3.04	3.30	3.75	3.75
α	.012	.011	.009	.016	.015	.017	.036	.049
R	.035		.045		.069		.10	
M	-3.44	-3.68	-3.76	-3.20	-3.60	-2.88	-3.96	-3.44
-Q	0	3.76	3.68	3.60	3.20	3.96	2.88	-3.44
α	.0012	.0095	.0105	.0172	.0162	.0324	.0155	-.0326
R	.0079		.0208		.0364		-.0128	
M	-.40	.40	-.21	.21	-.36	.36	1.14	-1.14
-Q	0	.21	-.40	.36	-.21	-1.14	-.36	-1.14
α	.00007	.00053	.00049	.00132	-.0016	-.0088	-.0016	-.0004
R	.00044		.00027		-.0077		-.0015	
M	-.02	.02	-.08	.08	.16	-.16	-.03	.03
M	-3.86	-3.26	-4.05	-2.91	-3.80	-2.68	-2.85	-4.55

Year		1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2100		2101		2102		2103		2104		2105		2106		2107		2108		2109		2110		2111		2112		2113		2114		2115		2116		2117		2118		2119		2120		2121		2122		2123		2124		2125		2126		2127		2128		2129		2130		2131		2132		2133		2134		2135		2136		2137		2138		2139		2140		2141		2142		2143		2144		2145		2146		2147		2148		2149		2150		2151		2152		2153		2154		2155		2156		2157		2158		2159		2160		2161		2162		2163		2164		2165		2166		2167		2168		2169		2170		2171		2172		2173		2174		2175		2176		2177		2178		2179		2180		2181		2182		2183		2184		2185		2186		2187		2188		2189		2190		2191		2192		2193		2194		2195		2196		2197		2198		2199		2200		2201		2202		2203		2204		2205		2206		2207		2208		2209		2210		2211		2212		2213		2214		2215		2216		2217		2218		2219		2220		2221		2222		2223		2224		2225		2226		2227		2228		2229		2230		2231		2232		2233		2234		2235		2236		2237		2238		2239		2240		2241		2242		2243		2244		2245		2246		2247		2248		2249		2250		2251		2252		2253		2254		2255		2256		2257		2258		2259		2260		2261		2262		2263		2264		2265		2266		2267		2268		2269		2270		2271		2272		2273		2274		2275		2276		2277		2278		2279		2280		2281		2282		2283		2284		2285		2286		2287		2288		2289		2290		2291		2292		2293		2294		2295		2296		2297		2298		2299		2300		2301		2302		2303		2304		2305		2306		2307		2308		2309		2310		2311		2312		2313		2314		2315		2316		2317		2318		2319		2320		2321		2322		2323		2324		2325		2326		2327		2328		2329		2330		2331		2332		2333		2334		2335		2336		2337		2338		2339		2340		2341		2342		2343		2344		2345		2346		2347		2348		2349		2350		2351		2352		2353		2354		2355		2356		2357		2358		2359		2360		2361		2362		2363		2364		2365		2366		2367		2368		2369		2370		2371		2372		2373		2374		2375		2376		2377		2378		2379		2380		2381		2382		2383		2384		2385		2386		2387		2388		2389		2390		2391		2392		2393		2394		2395		2396		2397		2398		2399		2400		2401		2402		2403		2404		2405		2406		2407		2408		2409		2410		2411		2412		2413		2414		2415		2416		2417		2418		2419		2420		2421		2422		2423		2424		2425		2426		2427		2428		2429		2430		2431		2432		2433		2434		2435		2436		2437		2438		2439		2440		2441		2442		2443		2444		2445		2446		2447		2448		2449		2450		2451		2452		2453		2454		2455		2456		2457		2458		2459		2460		2461		2462		2463		2464		2465		2466		2467		2468		2469		2470		2471		2472		2473		2474		2475		2476		2477		2478		2479		2480		2481		2482		2483		2484		2485		2486		2487		2488		2489		2490		2491		2492		2493		2494		2495		2496		2497		2498		2499		2500		2501		2502		2503		2504		2505		2506		2507		2508		2509		2510		2511		2512		2513		2514		2515		2516		2517		2518		2519		2520		2521		2522		2523		2524		2525		2526		2527		2528		2529		2530		2531		2532		2533		2534		2535		2536		2537		2538		2539		2540		2541		2542		2543		2544		2545		2546		2547		2548		2549		2550		2551		2552		2553		2554		2555		2556		2557		2558		2559		2560		2561		2562		2563		2564		2565		2566		2567		2568		2569		2570		2571		2572		2573		2574		2575		2576		2577		2578		2579		2580		2581		2582		2583		2584		2585		2586		2587		2588		2589		2590		2591		2592		2593		2594		2595		2596		2597		2598		2599		2600		2601		2602		2603		2604		2605		2606		2607		2608		2609		2610		2611		2612		2613		2614		2615		2616		2617		2618		2619		2620		2621		2622		2623		2624		2625		2626		2627		2628		2629		2630		2631		2632		2633		2634		2635		2636		2637		2638		2639		2640		2641		2642		2643		2644		2645		2646		2647		2648		2649		2650		2651		2652		2653		2654		2655		2656		2657		2658		2659		2660		2661		2662		2663		2664		2665		2666		2667		2668		2669		2670		2671		2672		2673		2674		2675		2676		2677		2678		2679		2680		2681		2682		2683		2684		2685		2686		2687		2688		2689		2690		2691		2692		2693		2694		2695		2696		2697		2698		2699		2700		2701		2702		2703		2704		2705		2706		2707		2708		2709		2710		2711		2712		2713		2714		2715		2716		2717		2718		2719		2720		2721		2722		2723		2724		2725		2726		2727		2728		2729		2730		2731		2732		2733		2734		2735		2736		2737		2738		2739		2740		2741		2742		2743		2744		2745		2746		2747		2748		2749		2750		2751		2752		2753		2754		2755		2756		2757		2758		2759		2760		2761		2762		2763		2764		2765		2766		2767		2768		2769		2770		2771		2772		2773		2774		2775		2776		2777		2778		2779		2780		2781		2782		2783		2784		2785		2786		2787		2788		2789		2790		2791		2792		2793		2794		2795		2796		2797		2798		2799		2800		2801		2802		2803		2804		2805		2806		2807		2808		2809		2810		2811		2812		2813		2814		2815		2816		2817		2818		2819		2820		2821		28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F	F	F	G	G	H	H	I
-5.73	-3.78	-3.28	-3.04	-3.48	-3.24	-3.60	-3.32
.049	-.036	-.027	-.015	-.016	-.009	-.011	-.012
.10		-.069		-.045		-.035	
3.44	3.96	2.88	3.60	3.20	3.76	3.68	3.44
3.44	-2.88	-3.96	-3.20	-3.60	-3.68	-3.76	0
.0326	-.0155	-.0324	-.0162	-.0172	-.0105	-.0095	-.0012
.0128		-.0364		-.0208		-.0079	
1.14	-1.14	-.36	.36	-.21	.21	-.40	.40
1.14	.36	1.14	.21	-.36	.40	-.21	0
.0004	.0016	.0088	.0016	-.00132	.00094	-.00053	-.00007
.0015		.0077		-.00027		-.00044	
-.03	.03	.16	-.16	-.08	.08	-.02	.02
4.55	2.85	2.68	3.80	2.91	4.05	3.26	3.86

Moment Computations - Web Members

Member AA'

Dh	=	3140	fk
hh E-60	=	2755	
Impact	=	<u>590</u>	
Total		6485	
hh H-15-S12-44	=	367	
Conc.	=	86	
Impact	=	<u>62</u>	
Total		515	
Sidewalk	=	222	

Design Moment = 11,762 fk

Member BB'

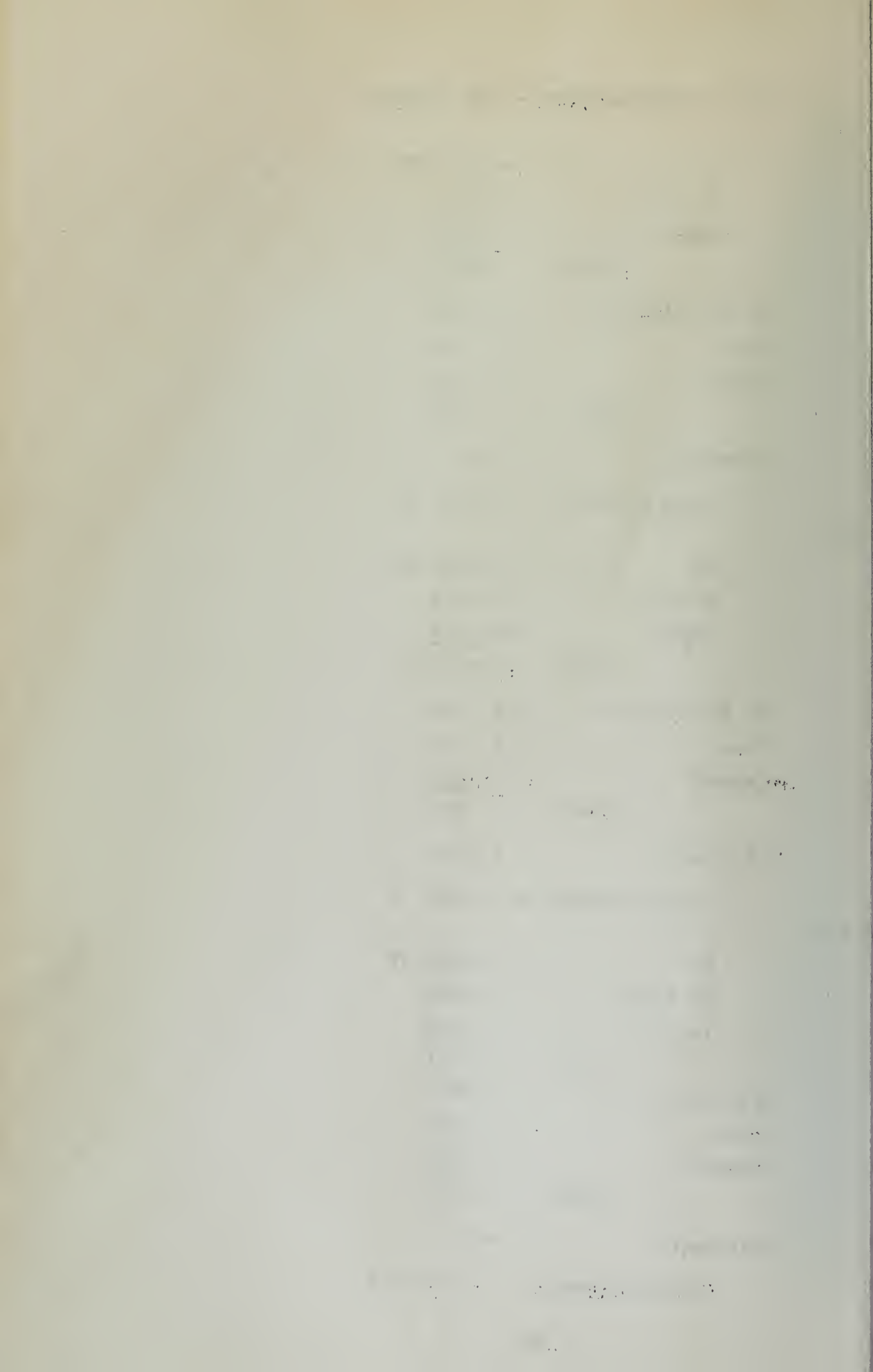
Dh	=	5180	fk
hh E-60	=	4423	
Impact	=	<u>947</u>	
Total		10,550	
hh H15-S12-44	=	606	
Conc.	=	142	
Impact	=	<u>102</u>	
Total		850	
Sidewalk	=	362	

Design Moment = 11,762 fk

Member CC'

Dh	=	3258	fk
hh E-60	=	2882	
Impact	=	<u>626</u>	
Total		6766	
hh H15-S12-44	=	381	
Conc.	=	109	
Impact	=	<u>77</u>	
Total		567	
Sidewalk	=	242	

Design Moment = 7,575 fk

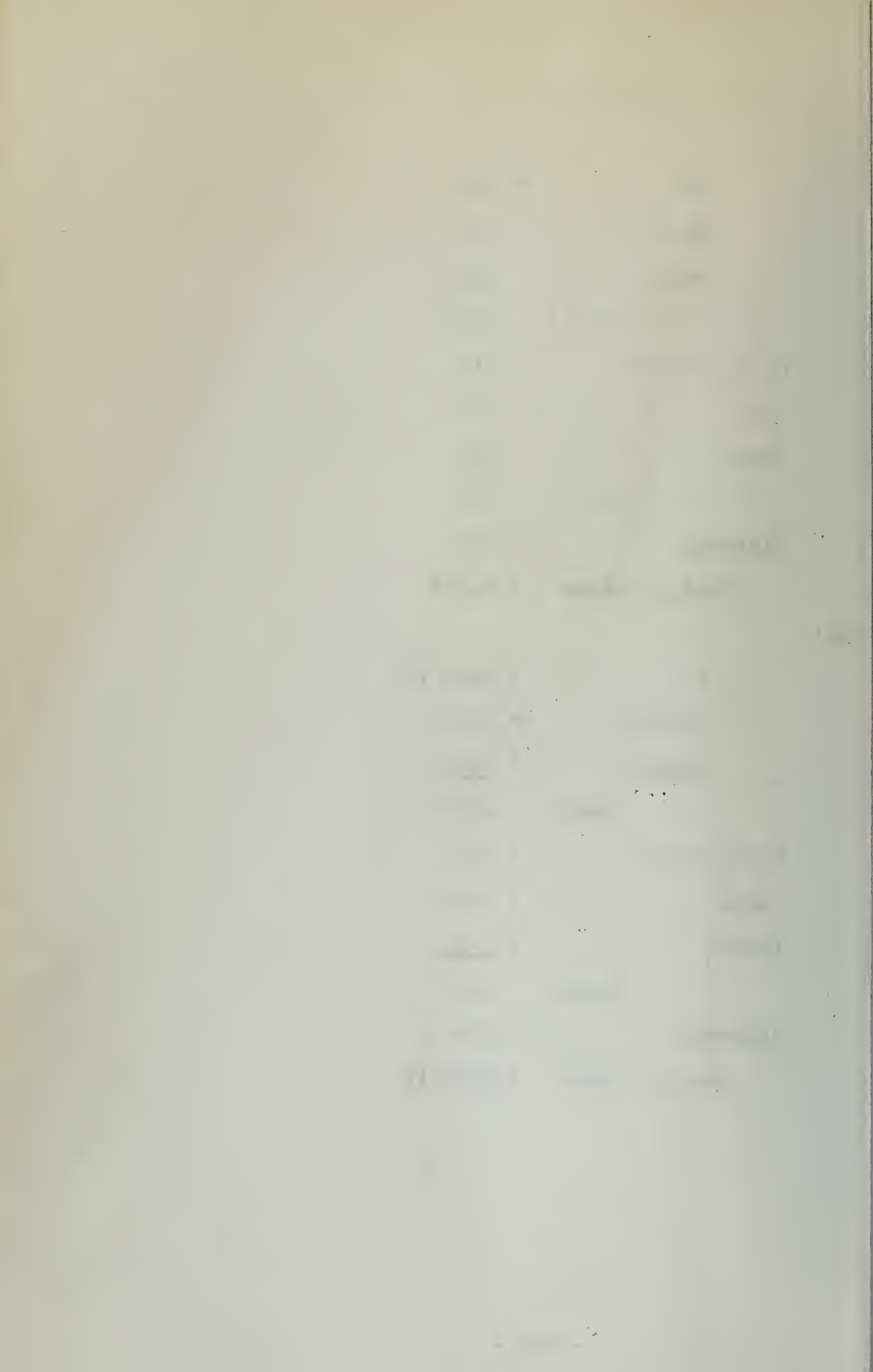


Member DE

Dh	=	1830
hh-E-60	=	1652
Impact	=	<u>436</u>
Total		3948
hr H15-S12-44	=	215
Conc.	=	79
Impact	=	<u>53</u>
Total		347
Sidewalk	=	152
Design Moment	=	4,447

Member EE'

Dh	=	1156 fk
hh-E-60	=	1110
Impact	=	<u>389</u>
Total		2655
hr h15-S12-44	=	135
Conc.	=	64
Impact	=	<u>42</u>
Total		241
Sidewalk	=	104
Design Moment	=	3000 fk



Moment Computations - Chord Members

Member AB

DL	=	3140	fk
LL-E60	=	2755	
Impact	=	<u>590</u>	
Total		6485	
LL HL5-SL2-44	=	367	
Conc.	=	86	
Impact	=	<u>62</u>	
Total		515	
Sidewalk	=	222	
Design Moment	=	7,222	

Member BC

DL	=	2330	fk
LL-E60	=	2128	
Impact	=	<u>454</u>	
Total		4912	
LL HL5-SL2-44	=	273	
Conc.	=	80	
Impact	=	<u>55</u>	
Total		408	
Sidewalk	=	172	
Design Moment	=	5,492	fk

Member CD

DL	=	1525	fk
LL-E60	=	1382	
Impact	=	<u>321</u>	
Total	=	3128	
LL H15-S12-44	=	179	
Conc.	=	61	
Impact	=	<u>41</u>	
Total	=	281	
Sidewalk	=	120	
Design Moment	=	3,529	fk

Member DE

DL	=	1135	fk
LL-E60	=	1088	
Impact	=	<u>327</u>	
Total	=	2550	
LL H15-S12-44	=	133	
Conc.	=	62	
Impact	=	<u>37</u>	
Total	=	232	
Sidewalk	=	95	
Design Moment	=	2,877	fk

Influence Line Computations.

Load at B

Panel #1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)1} = 5.77$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28$$

$$Q_{R1} = \frac{.875 \times 30 - .0866 \times 26.25}{2(2 - .0866)1} = 6.28$$

Panel #2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)} = -1.15$$

$$-Q_C = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{-.125 \times 30 - .0443 \times 22.5}{2(2 - .0443)1} = -1.21$$

Panel #3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)1} = -1.13$$

$$-Q_D = \frac{-.125 \times 30 - .0482 \times 18.75}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{-.125 \times 30 - .0482 \times 18.75}{2(2 - .0482)1} = -1.19$$

Panel #4

$$-Q_D = \frac{-1(.125 \times 30)}{4} = -.94$$

$$-Q_E = \frac{-.125 \times 30}{4} = -.94$$

$$Q_{R4} = \frac{-.125 \times 30}{4} = -.94$$

THE

THE

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Panel 5

$$-Q_E = \frac{-.125 \times 30}{4} = -0.94$$

$$-Q_F = \frac{-.125 \times 30}{4} = -0.94$$

$$Q_{R5} = \frac{-.125 \times 30}{4 \times 1} = -0.94$$

Panel 6

$$-Q_G = \frac{(.0507 \times 1 - 1)(-.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)1} = -0.78$$

$$-Q_F = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -0.82$$

$$Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)1} = -0.82$$

Panel 7

$$-Q_H = \frac{(.0463 \times 1 - 1)(-.0443 \times 7.5 + .125 \times 30)}{2(2 - .0443)1} = -0.83$$

$$-Q_G = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)} = -0.87$$

$$Q_{R7} = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)1} = -0.87$$

Panel 8

$$-Q_I = \frac{(.0942 \times 1 - 1)(-.0866 \times 3.75 + .125 \times 30)}{2(2 - .0866)1} = -0.81$$

$$-Q_H = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -0.90$$

$$Q_{R8} = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -0.90$$

Load at C

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)1} = 4.89$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{.75 \times 30 - .0866 \times 22.5}{2(2 - .0866)1} = 5.38$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)1} = 4.96$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{.75 \times 30 - .0443 \times 45}{2(2 - .0443)1} = 5.23$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)1} = -2.36$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{-.25 \times 30 - .0482 \times 37.5}{2(2 - .0482)1} = -2.38$$

Panel 4

$$-Q_D = \frac{-1(.25 \times 30)}{4} = -1.87$$

$$-Q_E = \frac{-.25 \times 30}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4} = -1.87$$

1890

1891

1892

1893

1894

1895

1896

1897

1898

1899

1900

1901

Panel 5

$$-Q_E = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -1.88$$

Panel 6

$$-Q_E = -1.64$$

$$-Q_G = -1.56$$

$$Q_{R6} = -1.64$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.66$$

$$Q_{R7} = -1.74$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.62$$

$$Q_{R8} = -1.80$$

11-15

11-16

11-17

11-18

11-19

11-20

11-21

11-22

11-23

11-24

11-25

Load at D

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)1} = 4.12$$

$$-Q_B = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)1} = 4.49$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)1} = 4.14$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{.625 \times 30 - .0443 \times 37.5}{2(2 - .0443)1} = 4.36$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)1} = 3.91$$

$$-Q_D = \frac{.625 \times 30 - .0482 \times 56.25}{2(2 - .0482)} = 4.12$$

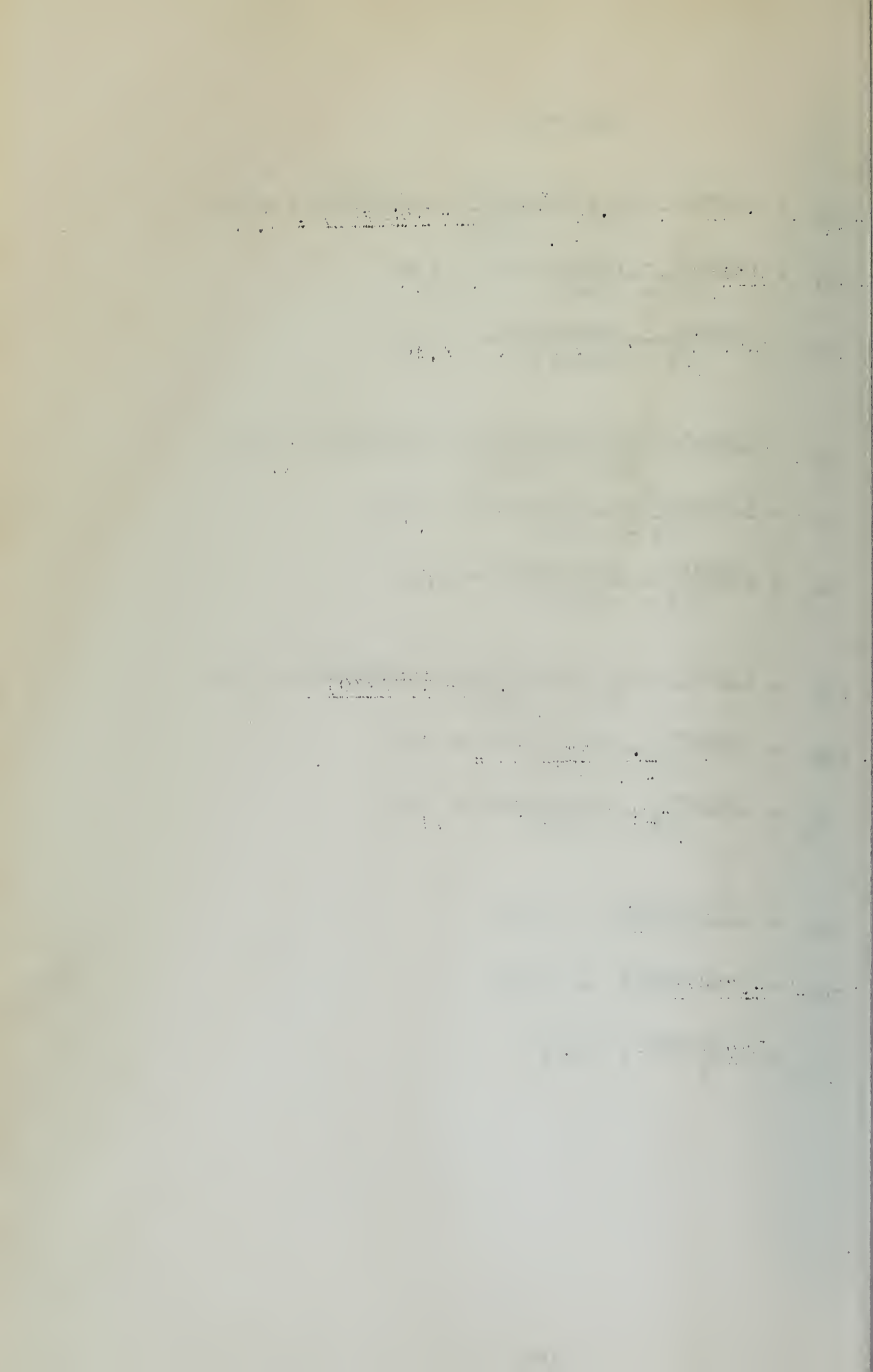
$$Q_{R3} = \frac{.625 \times 30 - .0482 \times 56.25}{2(2 - .0482)} = 4.12$$

Panel 4

$$-Q_D = \frac{-1(.375 \times 30)}{4} = -2.82$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.82$$

$$Q_{R4} = \frac{-.375 \times 30}{4} = -2.82$$



Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R5} = -2.82$$

Panel 6

$$-Q_F = -2.46$$

$$-Q_G = -2.34$$

$$Q_{R6} = -2.46$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.49$$

$$Q_{R7} = -2.61$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.43$$

$$Q_{R8} = -2.70$$



Load at E

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)1} = 3.26$$

$$-Q_B = \frac{.5 \times 30 - .0866 \times 15}{2(2 - .0866)} = 3.59$$

$$Q_{R1} = \frac{.5 \times 30 - .0866 \times 15}{2(2 - .0866)1} = 3.59$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)1} = 3.31$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R2} = \frac{.5 \times 30 - .0443 \times 30}{2(2 - .0443)1} = 3.49$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)1} = 3.13$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

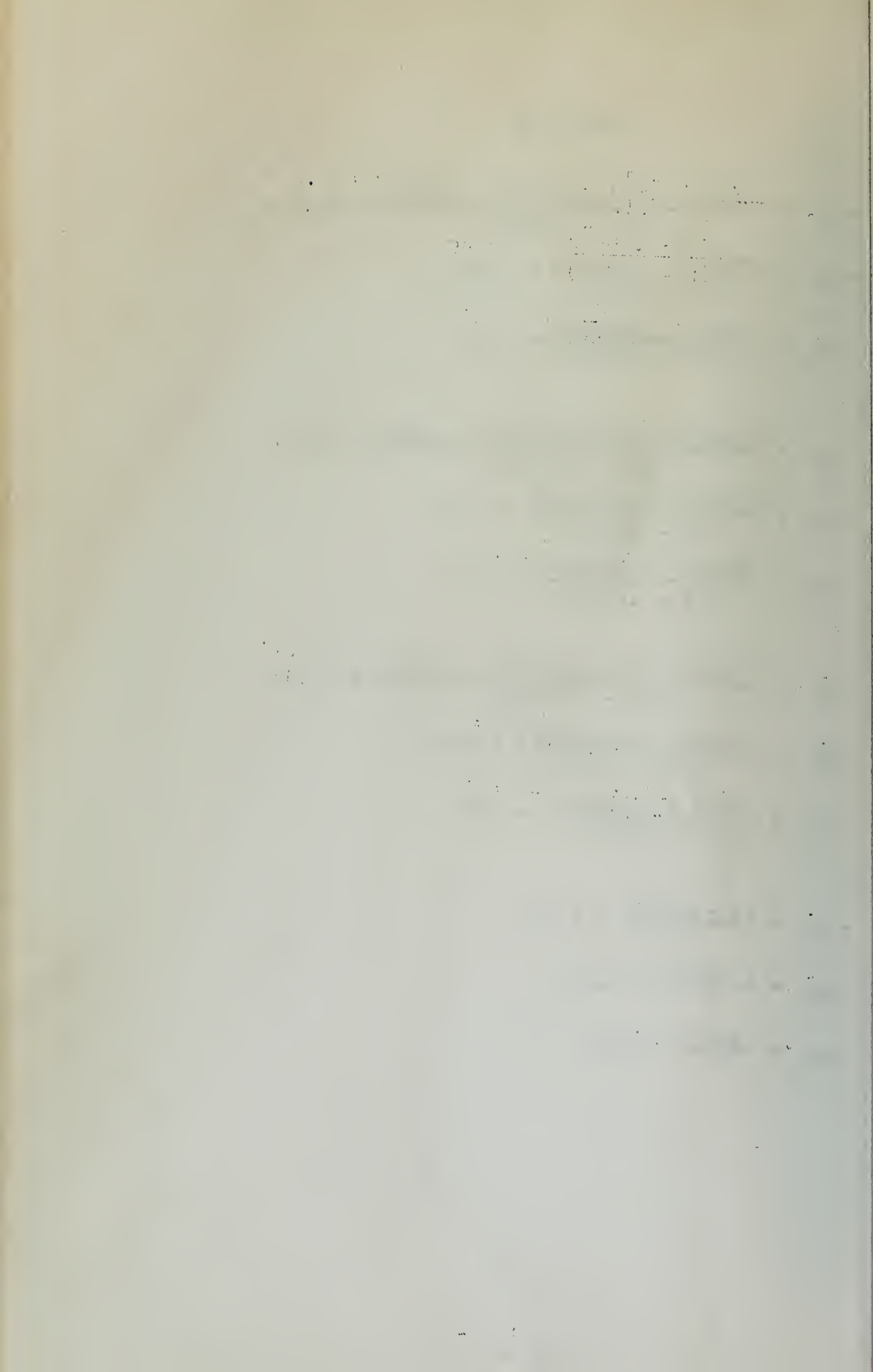
$$Q_{R3} = \frac{.5 \times 30 - .0482 \times 45}{2(2 - .0482)1} = 3.30$$

Panel 4

$$-Q_D = \frac{-1(-.5 \times 30)}{4} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R4} = \frac{.5 \times 30}{4} = 3.75$$



Panel 5

$$-Q_E = -3.76$$

$$-Q_F = -3.76$$

$$Q_{R5} = -3.76$$

Panel 6

$$-Q_E = -3.28$$

$$-Q_G = -3.12$$

$$Q_{R6} = -3.28$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.32$$

$$Q_{R7} = -3.48$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.24$$

$$Q_{R8} = -3.60$$

Equations for Determining Joint Constants

Panel 1

$$\left[1.5x1 + 1 + \frac{(3 - .0866)(.0942x1 - 1)}{2(2 - .0866)} \right] A + \left[\frac{1}{2} + \frac{(3 - 2x.0866)(.0942x1 - 1)}{2(2 - .0866)} \right] B = -Q_A$$

$$1.82A - .17B = -Q_A$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0866)1}{2(2 - .0866)} \right] B + \left[\frac{1}{2} - \frac{(3 - .0866)1}{2(2 - .0866)} \right] A = -Q_B$$

$$1.76B - .26A = -Q_B$$

Panel 2

$$\left[1.5x1 + 1 + \frac{(3 - .0443)(.0463x1 - 1)}{2(2 - .0443)} \right] B + \left[\frac{1}{2} + \frac{(3 - 2x.0443)(.0463x1 - 1)}{2(2 - .0443)} \right] C = -Q_B$$

$$1.78B - .21C = -Q_B$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0443)1}{2(2 - .0443)} \right] C + \left[\frac{1}{2} + \frac{(3 - .0443)1}{2(2 - .0443)} \right] B = -Q_C$$

$$1.76C - .26B = -Q_C$$

• • •

Panel 3

$$\left[1.5x1 + 1 + \frac{(3 - .0482)(.0507x1 - 1)}{2(2 - .0482)} \right] C + \left[\frac{1}{2} + \frac{(3 - 2x.0482)(.0507x1 - 1)}{2(2 - .0482)} \right] D = -Q_C$$

$$1.78C - .21D = -Q_C$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0482)x1}{2(2 - .0482)} \right] D + \left[\frac{1}{2} - \frac{(3 - .0482)x1}{2(2 - .0482)} \right] C = -Q_D$$

$$1.76D - .26C = -Q_D$$

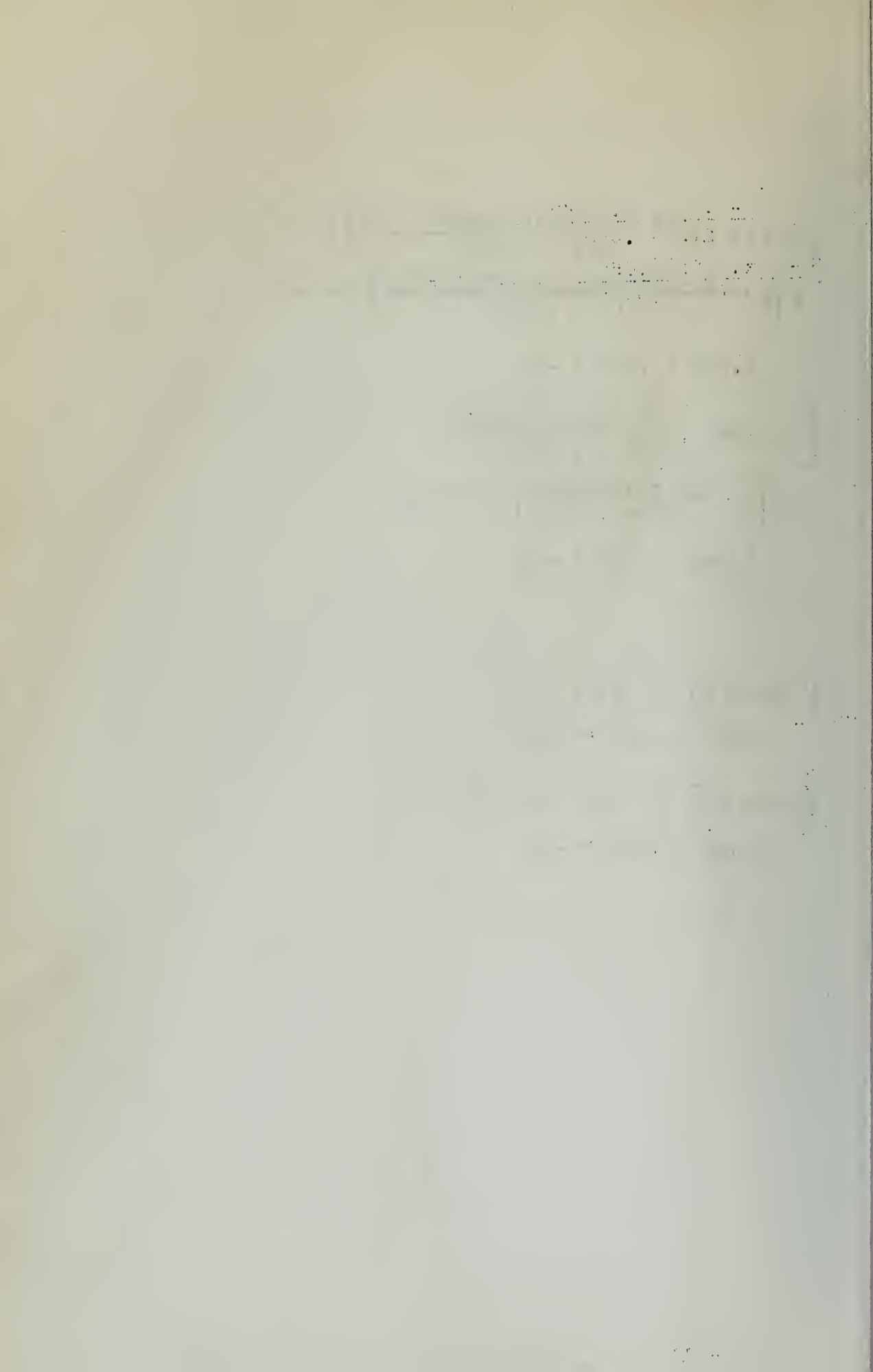
Panel 4

$$\left[1.5x1 + \frac{1}{4} \right] D - \frac{1}{4}E = -Q_D$$

$$1.75D - .25E = -Q_D$$

$$\left[1.5x1 + \frac{1}{4} \right] E - \frac{1}{4}D = -Q_E$$

$$1.75E - .25D = -Q_E$$



Joint Constant Computation - Load at B

Panel 1

$$1.82A - .17B = 5.77$$

$$-.26A + 1.76B = 6.28$$

$$A = 3.56 \quad B = 4.09$$

$$R_1 = \frac{2.91 \times 3.56 + 2.83 \times 4.09}{3.82} + 6.28 = 12.03$$

$$M_{FL} = (3.56 + \frac{4.09}{2} - 12.03) = -6.43$$

$$M_{BA} = (4.09 + \frac{3.56}{2} - 12.03) = -6.16$$

Panel 2

$$1.78B - .21C = -1.15$$

$$-.26B + 1.76C = -1.21$$

$$B = -.74 \quad C = -.80$$

$$R_2 = \frac{-2.96 \times .74 - 2.91 \times .80}{3.92} - 1.21 = -2.36$$

$$M_{BC} = (-.74 - \frac{.80}{2} + 2.36) = 1.22$$

$$M_{CB} = (-.80 - \frac{.74}{2} + 2.36) = 1.19$$

Panel 3

$$1.78C - .21D = -1.13$$

$$-.26C + 1.76D = -1.19$$

$$C = -.73 \quad D = -.78$$

$$R_3 = \frac{-2.95 \times .73 - 2.90 \times .78}{3.90} - 1.19 = -2.33$$

$$M_{CD} = (-.73 - \frac{.78}{2} + 2.33) = 1.21$$

$$M_{DC} = (-.78 - \frac{.73}{2} + 2.33) = 1.19$$

Panel 4

$$1.75D - .25E = -.94$$

$$-.25D + 1.75E = -.94$$

$$D = -.63 \quad E = -.63$$

$$R_4 = \frac{3}{4}(-.63 - .63) - .94 = -1.88$$

$$M_{DE} = (-.63 - \frac{.63}{2} + 1.88) = .94$$

$$M_{ED} = (-.63 - \frac{.63}{2} + 1.88) = .94$$

Panel 5

$$1.75E - .25F = -0.94$$

$$-.25E + 1.75F = -0.94$$

$$E = -0.63 \quad F = -0.63$$

$$R_5 = 3/4(-0.63 - 0.63) - 0.94 = -1.88$$

$$M_{EF} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

$$M_{FE} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

Panel 6

$$1.76F - .26G = -0.82$$

$$-.21F + 1.78G = -0.78$$

$$F = -0.54 \quad G = -0.50$$

$$R_6 = \frac{-2.90 \times .54 - 2.95 \times .50}{3.90} - .82 = -1.60$$

$$M_{FG} = 1(-0.54 - \frac{1}{2} \times 0.50 + 1.60) = 0.81$$

$$M_{GF} = 1(-0.50 - \frac{1}{2} \times 0.54 + 1.60) = 0.83$$

Panel 7

$$1.76G - .26H = -0.87$$

$$-.20G + 1.78H = -0.83$$

$$G = -0.57 \quad H = -0.53$$

$$R_7 = \frac{-2.91 \times .57 - 2.96 \times 0.53}{3.91} - 0.87 = 1.70$$

$$M_{GH} = 1(-0.57 - \frac{1}{2} \times 0.53 + 1.70) = .87$$

$$M_{HG} = 1(-0.53 - \frac{1}{2} \times 0.57 + 1.70) = .89$$

Panel 8

$$1.76H - .26I = -0.90$$

$$-.17H + 1.92I = -0.81$$

$$H = -0.59 \quad I = -0.50$$

$$R_8 = \frac{-2.83 \times .59 - 2.91 \times .50}{3.83} - 0.90 = -1.71$$

$$M_{HI} = 1(-0.59 - \frac{1}{2} \times 0.50 + 1.71) = 0.87$$

$$M_{IH} = 1(-0.50 - \frac{1}{2} \times 0.59 + 1.71) = 0.93$$

London, September 18, 1891

My dear Mr. Brewster

I have just received your letter of the 17th

and am glad to hear

that you are still interested in the

subject

I have been thinking of writing you for some time

but have been so busy that I could not find time

to do so

Yours truly

W. H. C.

Enclosed find a copy of the

report

I am, Sir, very respectfully,

Very truly yours,

W. H. C.

W. H. C.

W. H. C.

W. H. C.

W. H. C.

W. H. C.

W. H. C.

Panel 5

$$1.75E - .25F = -0.94$$

$$-.25E + 1.75F = -0.94$$

$$E = -0.63 \quad F = -0.63$$

$$R_5 = 3/4(-0.63 - 0.63) - 0.94 = -1.88$$

$$M_{EF} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

$$M_{FE} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

Panel 6

$$1.76F - .26G = -0.82$$

$$-.21F + 1.78G = -0.78$$

$$F = -0.54 \quad G = -0.50$$

$$R_6 = \frac{-2.90 \times .54 - 2.95 \times .50}{3.90} - .82 = -1.60$$

$$M_{FG} = 1(-0.54 - \frac{1}{2} \times 0.50 + 1.60) = 0.81$$

$$M_{GF} = 1(-0.50 - \frac{1}{2} \times 0.54 + 1.60) = 0.83$$

Panel 7

$$1.76G - .26H = -0.87$$

$$-.20G + 1.78H = -0.83$$

$$G = -0.57 \quad H = -0.53$$

$$R_7 = \frac{-2.91 \times .57 - 2.96 \times 0.53}{3.91} - 0.87 = 1.70$$

$$M_{GH} = 1(-0.57 - \frac{1}{2} \times 0.53 + 1.70) = .87$$

$$M_{HG} = 1(-0.53 - \frac{1}{2} \times 0.57 + 1.70) = .89$$

Panel 8

$$1.76H - .26I = -0.90$$

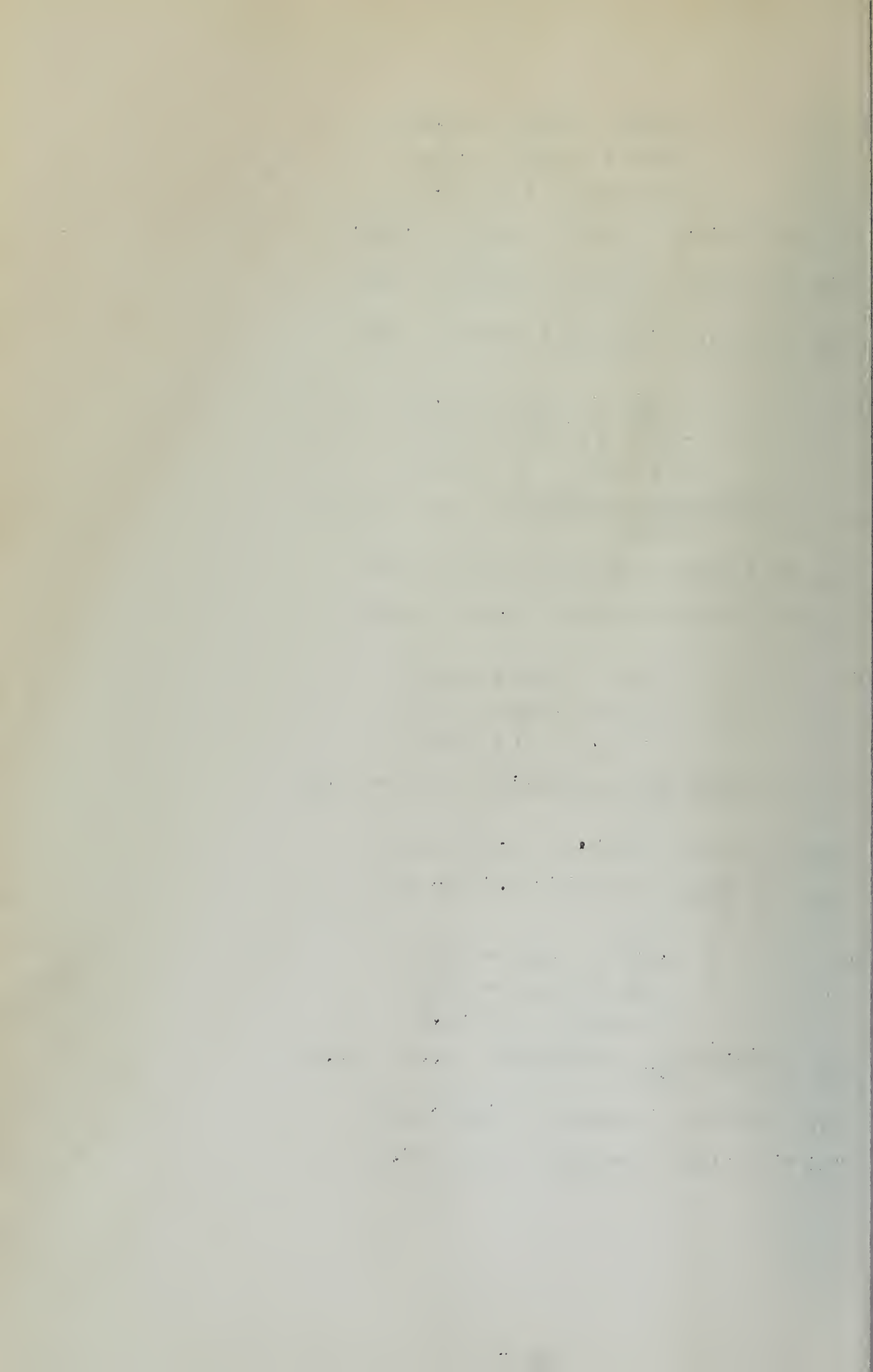
$$-.17H + 1.82I = -0.81$$

$$H = -0.59 \quad I = -0.50$$

$$R_8 = \frac{-2.83 \times .59 - 2.91 \times .50}{3.83} - 0.90 = -1.71$$

$$M_{HI} = 1(-0.59 - \frac{1}{2} \times 0.50 + 1.71) = 0.87$$

$$M_{IH} = 1(-0.50 - \frac{1}{2} \times 0.59 + 1.71) = 0.93$$



Joint Constant Computations - Load at C

Panel 1

$$1.82A - .17B = 4.89$$

$$-.26A + 1.76B = 5.38$$

$$A = 3.01 \quad B = 3.50$$

$$R_1 = \frac{2.91 \times 3.01 + 2.83 \times 3.50}{3.82} + 5.38 = 10.27$$

$$M_{AB} = (3.01 + \frac{3.50}{2} - 10.27) = -5.51$$

$$M_{BA} = (3.50 + \frac{3.01}{2} - 10.27) = -5.27$$

Panel 2

$$1.78B - .21C = 4.96$$

$$-.26B + 1.76C = 5.23$$

$$B = 3.20 \quad C = 3.44$$

$$R_2 = \frac{2.96 \times 3.20 + 2.91 \times 3.44}{3.92} + 5.23 = 10.21$$

$$M_{BC} = (3.20 + \frac{3.44}{2} - 10.21) = -5.29$$

$$M_{CB} = (3.44 + \frac{3.20}{2} - 10.21) = -5.17$$

Panel 3

$$1.78C - .21D = -2.36$$

$$-.26C + 1.76D = -2.38$$

$$C = -1.51 \quad D = -1.58$$

$$R_3 = \frac{-2.95 \times 1.51 - 2.90 \times 1.58}{3.90} - 2.38 = -4.70$$

$$M_{CD} = (-1.51 - \frac{1.58}{2} + 4.70) = 2.40$$

$$M_{DC} = (-1.58 - \frac{1.51}{2} + 4.70) = 2.37$$

Panel 4

$$1.75D - .25E = -1.87$$

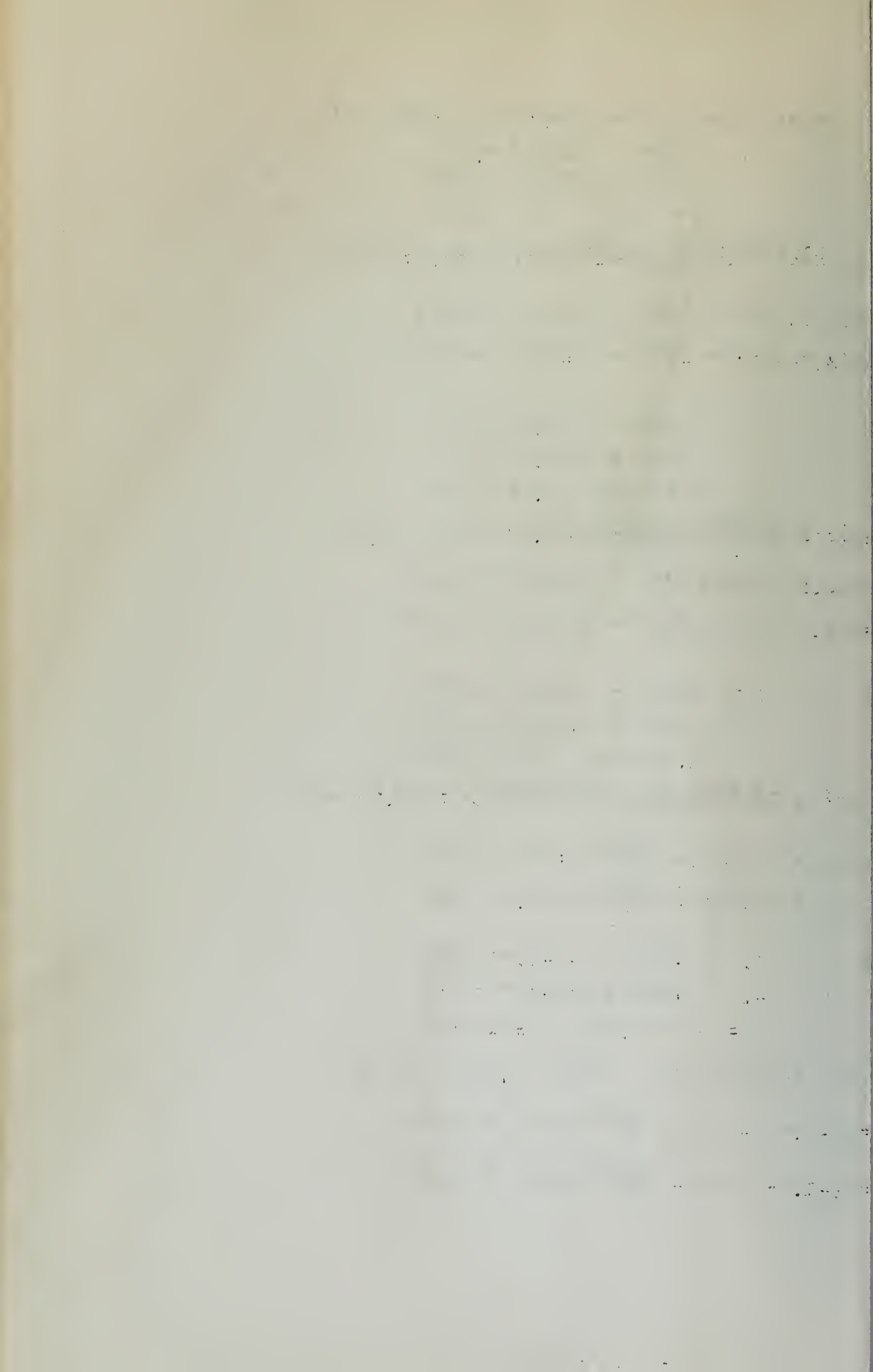
$$-.26D + 1.75E = -1.87$$

$$D = -1.25 \quad E = -1.25$$

$$R_4 = 3/4(-1.25 - 1.25) - 1.87 = -3.74$$

$$M_{DE} = (-1.25 - \frac{1.25}{2} + 3.74) = 1.87$$

$$M_{ED} = (-1.25 - \frac{1.25}{2} + 3.74) = 1.87$$



Panel 5

$$E = -1.26$$

$$F = -1.26$$

$$R_5 = -3.76$$

$$M_{EF} = 1.88$$

$$M_{FE} = 1.88$$

Panel 6

$$F = -1.08$$

$$G = -1.00$$

$$R_6 = -3.20$$

$$M_{FG} = 1.62$$

$$M_{GF} = 1.66$$

Panel 7

$$G = -1.14$$

$$H = -1.06$$

$$R_7 = -3.40$$

$$M_{GH} = 1.74$$

$$M_{HG} = 1.78$$

Panel 8

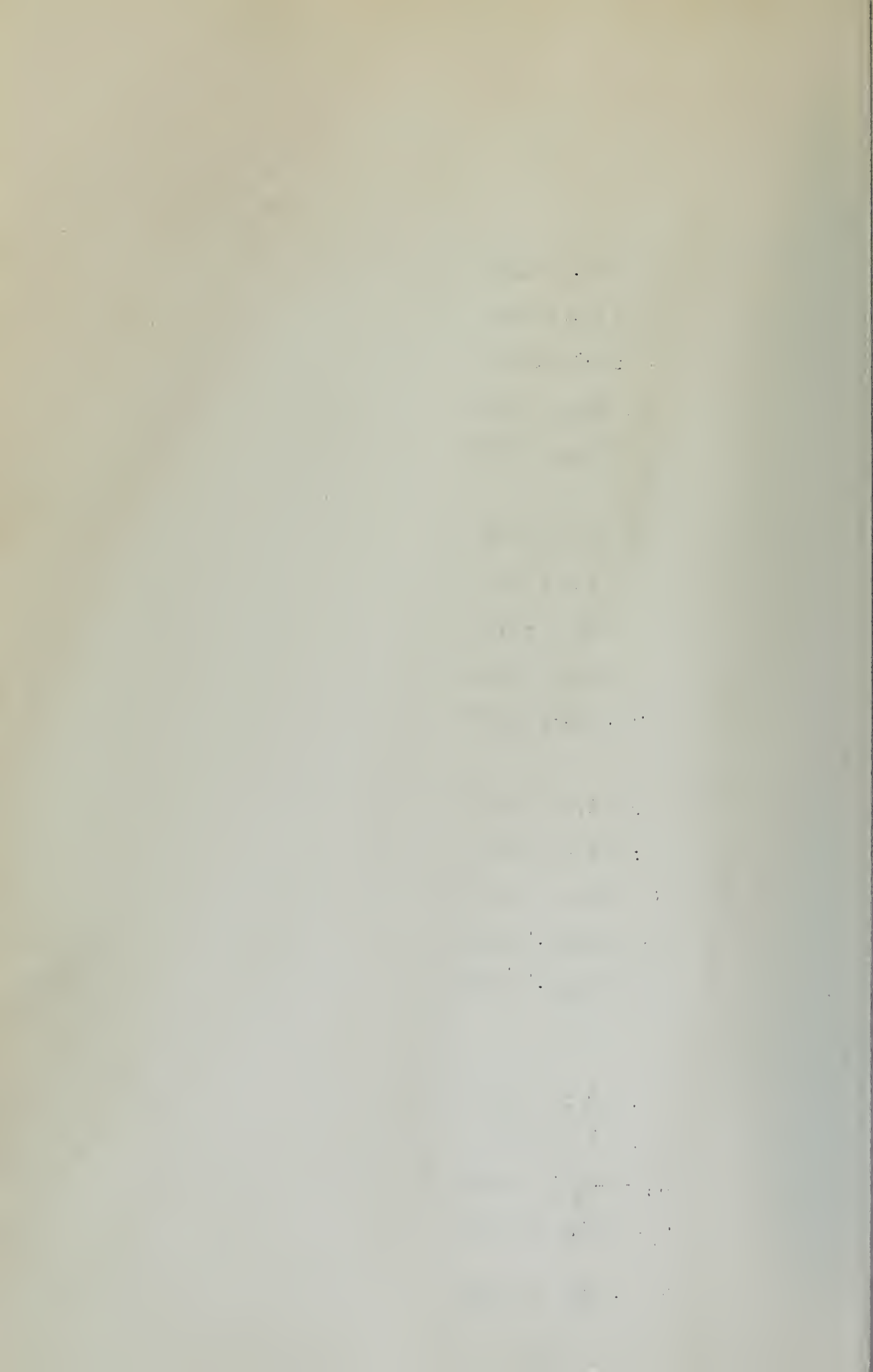
$$H = -1.18$$

$$I = -1.00$$

$$R_8 = -3.42$$

$$M_{HI} = 1.74$$

$$M_{IH} = 1.86$$



Joint Constant Computation-Load at D

Panel 1

$$\begin{aligned} 1.82A - .17B &= 4.12 \\ -.26A + 1.76B &= 4.49 \\ A &= 2.54 \quad B = 2.92 \end{aligned}$$

$$R_1 = \frac{2.91 \times 2.54 + 2.83 \times 2.92 + 4.49}{3.82} = 8.59$$

$$M_{AB} = (2.54 + \frac{2.92}{2} - 8.59) = -4.59$$

$$M_{BA} = (2.92 + \frac{2.54}{2} - 8.59) = -4.50$$

Panel 2

$$\begin{aligned} 1.78B - .21C &= 4.14 \\ -.26B + 1.76C &= 4.36 \end{aligned}$$

$$B = 2.67 \quad C = 2.87$$

$$R_2 = \frac{2.96 \times 2.67 + 2.91 \times 2.87 + 4.36}{3.92} = 8.51$$

$$M_{BC} = (2.67 + \frac{2.87}{2} - 8.51) = -4.41$$

$$M_{CB} = (2.87 + \frac{2.67}{2} - 8.51) = -4.31$$

Panel 3

$$\begin{aligned} 1.78C - .21D &= 3.91 \\ -.26C + 1.76D &= 4.12 \end{aligned}$$

$$C = 2.52 \quad D = 2.71$$

$$R_3 = \frac{2.95 \times 2.52 + 2.90 \times 2.71 + 4.12}{3.90} = 8.04$$

$$M_{CD} = (2.52 + \frac{2.71}{2} - 8.04) = -4.17$$

$$M_{DC} = (2.71 + \frac{2.52}{2} - 8.04) = -4.07$$

Panel 4

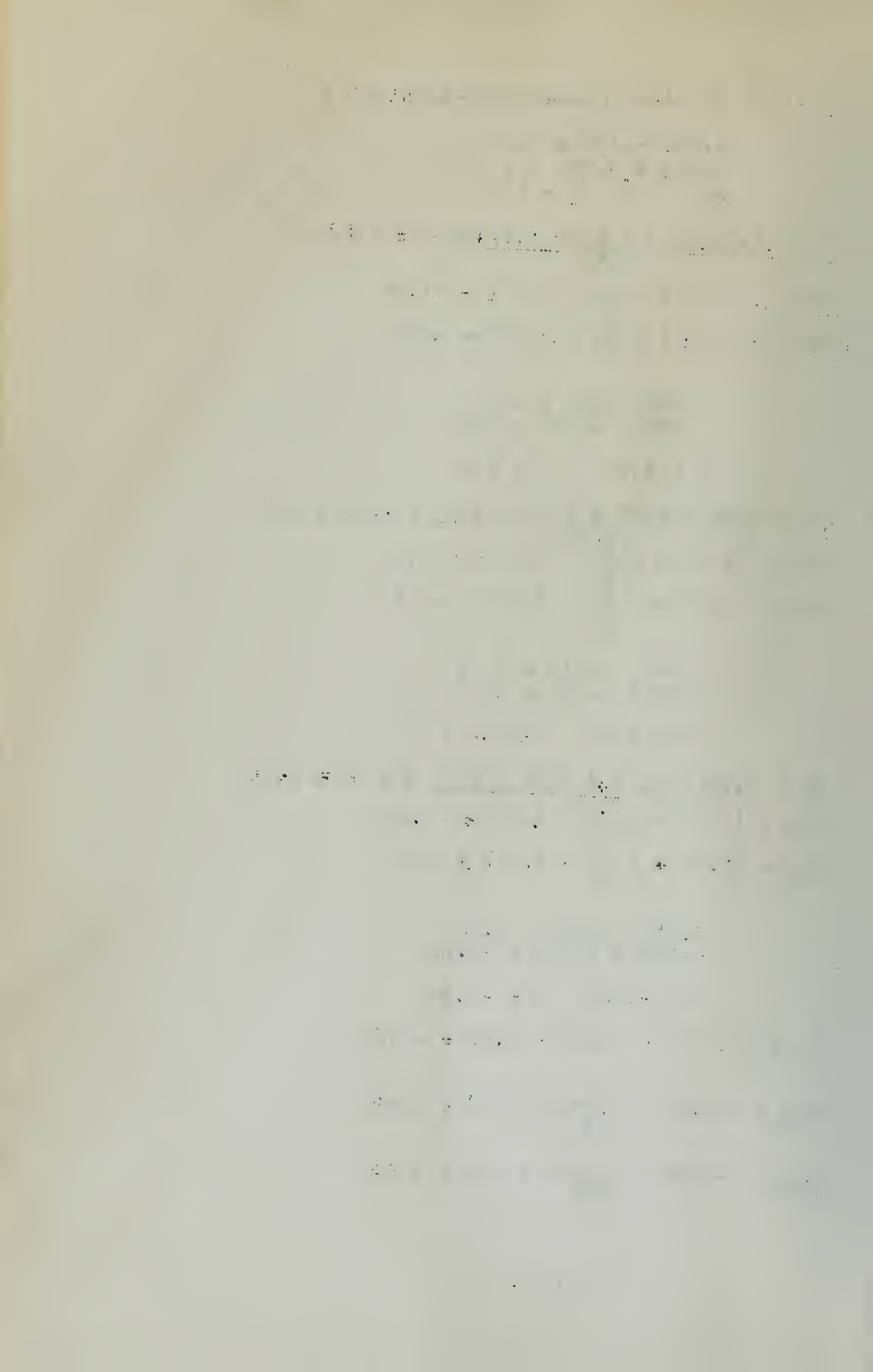
$$\begin{aligned} 1.75D - .25E &= -2.82 \\ -.25D + 1.75E &= -2.82 \end{aligned}$$

$$D = -1.88 \quad E = -1.88$$

$$R_4 = \frac{3(-1.88 - 1.88) - 2.82}{4} = -5.64$$

$$M_{DE} = (-1.88 - \frac{1.88}{2} + 5.64) = 2.82$$

$$M_{ED} = (-1.88 - \frac{1.88}{2} + 5.64) = 2.82$$



Panel 5

$$\begin{aligned}E &= -1.89 \\F &= -1.89 \\R_5 &= -5.64 \\M_{EF} &= 2.82 \\M_{FE} &= 2.82\end{aligned}$$

Panel 6

$$\begin{aligned}F &= -1.62 \\G &= -1.50 \\R_6 &= 4.80 \\M_{FG} &= 2.43 \\M_{GF} &= 2.49\end{aligned}$$

Panel 7

$$\begin{aligned}G &= -1.71 \\H &= -1.59 \\R_7 &= -5.10 \\M_{GH} &= 2.61 \\M_{HG} &= 2.67\end{aligned}$$

Panel 8

$$\begin{aligned}H &= -1.77 \\I &= -1.50 \\R_8 &= -5.13 \\M_{HI} &= 2.61 \\M_{IH} &= 2.79\end{aligned}$$

Joint Constant Computation - Load at E

Panel 1

$$1.82A - .17B = 3.26$$

$$.26A + 1.76B = 3.59$$

$$A = 2.01 \quad B = 2.34$$

$$R_1 = \frac{2.91 \times 2.01 + 2.83 \times 2.34}{3.82} + 3.59 = 6.86$$

$$M_{AB} = (2.01 + \frac{2.34}{2} - 6.86) = -3.68$$

$$M_{BA} = (2.34 + \frac{2.01}{2} - 6.86) = -3.52$$

Panel 2

$$1.78B - .21C = 3.31$$

$$.26B + 1.76C = 3.49$$

$$B = 2.13 \quad C = 2.30$$

$$R_2 = \frac{2.96 \times 2.13 + 2.91 \times 2.30}{3.92} + 3.49 = 6.81$$

$$M_{BC} = (2.13 + \frac{2.30}{2} - 6.81) = -3.53$$

$$M_{CB} = (2.30 + \frac{2.13}{2} - 6.81) = -3.45$$

Panel 3

$$1.78C - .21D = 3.13$$

$$.26C + 1.76D = 3.30$$

$$C = 2.01 \quad D = 2.17$$

$$R_3 = \frac{2.95 \times 2.01 + 2.90 \times 2.17}{3.90} + 3.30 = 6.44$$

$$M_{CD} = (2.01 + \frac{2.17}{2} - 6.44) = -3.35$$

$$M_{DC} = (2.17 + \frac{2.01}{2} - 6.44) = -3.27$$

Panel 4

$$1.75D - .25E = 3.75$$

$$.25D + 1.75E = 3.75$$

$$D = 2.50 \quad E = 2.50$$

$$R_4 = 3/4(2.50 + 2.50) + 3.75 = 7.50$$

$$M_{DE} = (2.50 + \frac{2.50}{2} - 7.50) = -3.75$$

$$M_{ED} = (2.50 + \frac{2.50}{2} - 7.50) = -3.75$$

Panel 5

$$E = -2.52$$

$$F = -2.52$$

$$R_5 = -7.52$$

$$M_{EF} = 3.76$$

$$M_{FE} = 3.76$$

Panel 6

$$E = -2.16$$

$$G = -2.00$$

$$E_5 = -6.40$$

$$M_{EG} = 3.24$$

$$M_{GE} = 3.24$$

Panel 7

$$G = -2.28$$

$$F = -2.12$$

$$E_5 = -6.80$$

$$M_{GH} = 3.48$$

$$M_{HG} = 3.56$$

Panel 8

$$H = -2.06$$

$$G = -2.00$$

$$E_5 = -6.80$$

$$M_{HI} = 3.48$$

$$M_{IH} = 3.72$$

Moment Corrections - Load at PPl

Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = -1.22$$

$$A = -.07 \quad B = -.69$$

$$R_1 = \frac{-2.91 \times .07 - 2.83 \times .69}{3.83} = -.54$$

$$M_{AB} = 1(-.07 - \frac{1}{2} \times .69 + .54) = .12$$

$$M_{BA} = 1(-.69 - \frac{1}{2} \times .07 + .54) = -.18$$

Panel 2

$$1.78B - .20C = 6.16$$

$$-.26B + 1.76C = -1.21$$

$$B = 3.44 \quad C = -.18$$

$$R_2 = \frac{2.96 \times 3.44 - 2.91 \times .18}{3.91} = 2.47$$

$$M_{BC} = 1(3.44 - \frac{1}{2} \times .18 - 2.47) = .88$$

$$M_{CB} = 1(-.18 + \frac{1}{2} \times 3.44 - 2.47) = -.93$$

Panel 3

$$1.78C - .21D = -1.19$$

$$-.26C + 1.76D = -.94$$

$$C = -.74 \quad D = -.64$$

$$R_3 = \frac{-2.95 \times .74 - 2.90 \times .64}{3.90} = -1.04$$

$$M_{CD} = 1(-.74 - \frac{1}{2} \times .64 + 1.04) = -.02$$

$$M_{DC} = 1(-.64 - \frac{1}{2} \times .74 + 1.04) = .03$$

Panel 4

$$1.75D - .25E = -1.19$$

$$-.25D + 1.75E = -.94$$

$$D = -.77 \quad E = -.64$$

$$R_4 = 3/4(-.77 - .64) = -1.06$$

$$M_{DE} = 1(-.77 - \frac{1}{2} \times .64 + 1.06) = -.03$$

$$M_{ED} = 1(-.64 - \frac{1}{2} \times .77 + 1.06) = .03$$

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Panel 5

$$\begin{aligned} 1.75E - .25F &= -.94 \\ -.25E + 1.75F &= -.81 \end{aligned}$$

$$E = -.61$$

$$\begin{aligned} F &= -.54 \\ R_5 &= \frac{3}{4} (-.61 - .54) = -.86 \\ M_{EF} &= 1(-.61 - \frac{1}{2} \times .54 + .86) = -.02 \\ M_{FE} &= 1(-.54 - \frac{1}{2} \times .61 + .86) = .02 \end{aligned}$$

Panel 6

$$\begin{aligned} 1.76F - .26G &= -.94 \\ -.21F + 1.78G &= -.93 \end{aligned}$$

$$F = -.62$$

$$\begin{aligned} G &= -.56 \\ R_6 &= \frac{-2.90 \times .62 - 2.95 \times .56}{3.90} = -.88 \\ M_{FG} &= 1(-.62 - \frac{1}{2} \times .56 + .88) = 0 \\ M_{GF} &= 1(-.56 - \frac{1}{2} \times .62 + .88) = 0 \end{aligned}$$

Panel 7

$$\begin{aligned} 1.76G - .26H &= -.83 \\ -.20G + 1.78H &= -.87 \end{aligned}$$

$$G = -.55$$

$$H = -.55$$

$$\begin{aligned} R_7 &= \frac{-2.91 \times .55 - 2.96 \times .55}{3.91} = -.83 \\ M_{GH} &= 1(-.55 - \frac{1}{2} \times .55 + .83) = 0 \\ M_{HG} &= 1(-.55 - \frac{1}{2} \times .55 + .83) = 0 \end{aligned}$$

Panel 8

$$\begin{aligned} 1.76H - .26I &= -.89 \\ -.17H + 1.82I &= 0 \end{aligned}$$

$$H = -.51$$

$$I = -.05$$

$$\begin{aligned} R_8 &= \frac{-2.83 \times .51 - 2.91 \times .05}{3.83} = -.41 \\ M_{HI} &= 1(-.51 - \frac{1}{2} \times .05 + .42) = -.11 \\ M_{IH} &= 1(-.05 - \frac{1}{2} \times .51 + .42) = .11 \end{aligned}$$

1990

489

1. The first group of people who are interested in the study of the history of the world are the historians. They are people who study the past and try to understand what happened and why it happened. They use a variety of sources, including books, documents, and artifacts, to reconstruct the past. They also try to understand the people who lived in the past and how they thought and felt. Historians are interested in the past for a variety of reasons. Some are interested in the past because they want to know what happened and why it happened. Others are interested in the past because they want to understand the people who lived in the past and how they thought and felt. Still others are interested in the past because they want to learn from the mistakes of the past and avoid them in the future.

1. The first part of the paper is devoted to a review of the literature on the topic of the role of the state in the development of the economy. It is found that the state has played a significant role in the development of the economy in many countries, particularly in the case of developing countries. The state has been able to mobilize resources, provide infrastructure, and create a favorable environment for investment and growth.

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1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

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Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76 = -.88$$

$$A = -.04$$

$$B = -.49$$

$$R_1 = \frac{-2.91 \times .04 - 2.83 \times .49}{3.83} = -.40$$

$$M_{AB} = (.04 - \frac{1}{2} \times .49 + .40) = .11$$

$$M_{BA} = (.49 - \frac{1}{2} \times .04 + .40) = -.11$$

Panel 3

$$1.78C - .21D = .93$$

$$-.26C + 1.76D = .03$$

$$C = .59$$

$$D = .10$$

$$R_3 = \frac{2.95 \times .59 - 2.90 \times .10}{3.90} = .52$$

$$M_{CD} = 1(.59 + \frac{1}{2} \times .10 - .52) = .12$$

$$M_{DC} = 1(.10 + \frac{1}{2} \times .59 - .52) = -.12$$

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1. The first group of people who are interested in the study of the history of the United States are the people who are interested in the history of the United States.

Load at B

| nel | 1 | | 2 | | 3 | | 4 | |
|------|-------|-------|-------|-------|-------|-------|-------|------|
| | A | B | B | C | C | D | D | E |
| Q | 5.77 | 6.28 | -1.15 | -1.21 | -1.13 | -1.19 | -.94 | -.94 |
| Y | 3.56 | 4.09 | -.74 | -.80 | -.73 | -.78 | -.63 | -.63 |
| R | 2.03 | | -2.36 | | -2.33 | | -1.88 | |
| M' | -6.43 | -6.16 | 1.22 | 1.19 | 1.21 | 1.19 | 0.94 | 0.94 |
| Q | 0 | -1.22 | 6.16 | -1.21 | -1.19 | -.94 | -1.19 | -.94 |
| Y | -.07 | -.69 | 3.44 | -.18 | -.74 | -.64 | -.77 | -.64 |
| R | -.54 | | 2.47 | | -1.04 | | -1.06 | |
| M'' | .12 | -.18 | .88 | -.93 | -.02 | .03 | -.03 | .03 |
| Q | 0 | -.88 | | | -.93 | .03 | | |
| Y | -.04 | -.49 | | | .59 | .10 | | |
| R | -.40 | | | | .52 | | | |
| M''' | .11 | -.11 | 0 | 0 | .12 | -.12 | 0 | 0 |
| M | -6.20 | -6.45 | 2.10 | .26 | 1.31 | 1.10 | .91 | .97 |

1. The first part of the report deals with the general situation of the country and the progress of the work during the year. It is divided into two main sections: the first section deals with the general situation and the second section deals with the progress of the work.

2. The second part of the report deals with the results of the work during the year. It is divided into two main sections: the first section deals with the results of the work in the field and the second section deals with the results of the work in the laboratory.

3. The third part of the report deals with the conclusions of the work during the year. It is divided into two main sections: the first section deals with the conclusions of the work in the field and the second section deals with the conclusions of the work in the laboratory.

4. The fourth part of the report deals with the recommendations of the work during the year. It is divided into two main sections: the first section deals with the recommendations of the work in the field and the second section deals with the recommendations of the work in the laboratory.

5. The fifth part of the report deals with the summary of the work during the year. It is divided into two main sections: the first section deals with the summary of the work in the field and the second section deals with the summary of the work in the laboratory.

| Inel | 5 | | 6 | | 7 | | 8 | |
|------|-------|------|-------|------|-------|------|-------|------|
| | E | F | F | G | G | H | H | I |
| Q | -.94 | -.94 | -.82 | -.78 | -.87 | -.83 | -.90 | -.81 |
| | -.63 | -.63 | -.54 | -.50 | -.57 | -.53 | -.59 | -.50 |
| R | -1.88 | | -1.60 | | -1.70 | | -1.71 | |
| M' | .94 | .94 | .81 | .83 | .87 | .89 | .87 | .93 |
| Q | -.94 | -.81 | -.94 | -.87 | -.83 | -.87 | -.89 | 0 |
| | -.61 | -.54 | -.62 | -.56 | -.55 | -.55 | -.51 | -.05 |
| R | -.86 | | -.88 | | -.83 | | -.41 | |
| M'' | -.02 | .02 | 0 | 0 | 0 | 0 | -.11 | .11 |
| Q | | | | | | | | |
| R | | | | | | | | |
| M''' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| M | .92 | .96 | .81 | .83 | .87 | .89 | .76 | 1.04 |

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Moment Corrections Load at C

Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 5.29$$

$$A = .29$$

$$B = 3.04$$

$$R_1 = \frac{2.91 \times .29 + 2.83 \times 3.04}{3.83} = 2.46$$

$$M_{AB} = 1(.29 + \frac{1}{2} \times 3.04 - 2.46) = -.65$$

$$M_{BC} = 1(3.04 + \frac{1}{2} \times .29 - 2.46) = .72$$

Panel 2

$$1.78B - .20C = 5.27$$

$$-.26B + 1.76 C = -2.40$$

$$B = 2.85$$

$$C = -.94$$

$$R_2 = \frac{2.96 \times 2.85 - 2.91 \times .94}{3.91} = 1.46$$

$$M_{BC} = 1(2.85 - \frac{1}{2} \times .94 - 1.46) = .92$$

$$M_{CB} = 1(-.94 + \frac{1}{2} \times 2.85 - 1.46) = -.98$$

Panel 3

$$1.78C - .21D = 5.17$$

$$-.26C + 1.76D = -1.87$$

$$C = 2.82$$

$$D = -.65$$

$$R_3 = \frac{2.95 \times 2.82 - 2.90 \times .65}{3.90} = 1.65$$

$$M_{CD} = 1(2.82 - \frac{1}{2} \times .65 - 1.65) = .85$$

$$M_{DC} = 1(-.65 + \frac{1}{2} \times 2.82 - 1.65) = -.89$$

Let V be a vector space over F .

Let T be a linear transformation on V .

Let λ be an eigenvalue of T .

Let v be an eigenvector of T .

Then $Tv = \lambda v$.

Let W be the subspace of V consisting of all eigenvectors of T .

Then W is a subspace of V .

Let U be the subspace of V consisting of all vectors v such that $Tv = \lambda v$.

Then U is a subspace of V .

Let $W = U$.

Then $W = U$.

Let W be the subspace of V consisting of all eigenvectors of T .

Then W is a subspace of V .

Let U be the subspace of V consisting of all vectors v such that $Tv = \lambda v$.

Then U is a subspace of V .

Let $W = U$.

Then $W = U$.

Let W be the subspace of V consisting of all eigenvectors of T .

Then W is a subspace of V .

Let U be the subspace of V consisting of all vectors v such that $Tv = \lambda v$.

nel 4

$$1.75D - .25E = -2.37$$

$$-.25D + 1.75E = -1.88$$

$$D = -1.54$$

$$E = -1.30$$

$$R_4 = \frac{3}{4} (-1.54 - 1.30) = -2.13$$

$$M_{DE} = 1(-1.54 - \frac{1}{2} \times 1.30 + 2.13) = -.06$$

$$M_{ED} = 1(-1.30 - \frac{1}{2} \times 1.54 + 2.13) = .06$$

anel 5

$$1.75 - .25F = -1.87$$

$$-.25E + 1.75F = -1.62$$

$$E = -1.23$$

$$F = -1.10$$

$$R_5 = \frac{3}{4} (-1.23 - 1.10) = -1.75$$

$$M_{EF} = 1(-1.23 - \frac{1}{2} \times 1.10 + 1.75) = -.03$$

$$M_{FE} = 1(-1.10 - \frac{1}{2} \times -1.23 + 1.75) = .03$$

anel 6

$$1.76F - .26G = -1.88$$

$$-.21F + 1.78G = -1.74$$

$$F = -1.22$$

$$G = -1.12$$

$$R_6 = \frac{-2.90 \times 1.22 - 2.95 \times 1.12}{3.90} = -1.75$$

$$M_{FG} = 1(-1.22 - \frac{1}{2} \times 1.12 + 1.75) = -.03$$

$$M_{GF} = 1(-1.12 - \frac{1}{2} \times 1.22 + 1.75) = .02$$

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Panel 7

$$1.76G - .26H = -1.66$$

$$-.20G + 1.78H = -1.74$$

$$G = -1.10$$

$$H = -1.10$$

$$R_7 = \frac{-2.91 \times 1.10 - 2.96 \times 1.10}{3.91} = -1.65$$

$$M_{GH} = 1(-1.10 - \frac{1}{2} \times 1.10 + 1.65) = 0$$

$$M_{HG} = 1(-1.10 - \frac{1}{2} \times 1.10 + 1.65) = 0$$

Panel 8

$$1.76H - .26I = -1.78$$

$$-.17H + 1.82I = 0$$

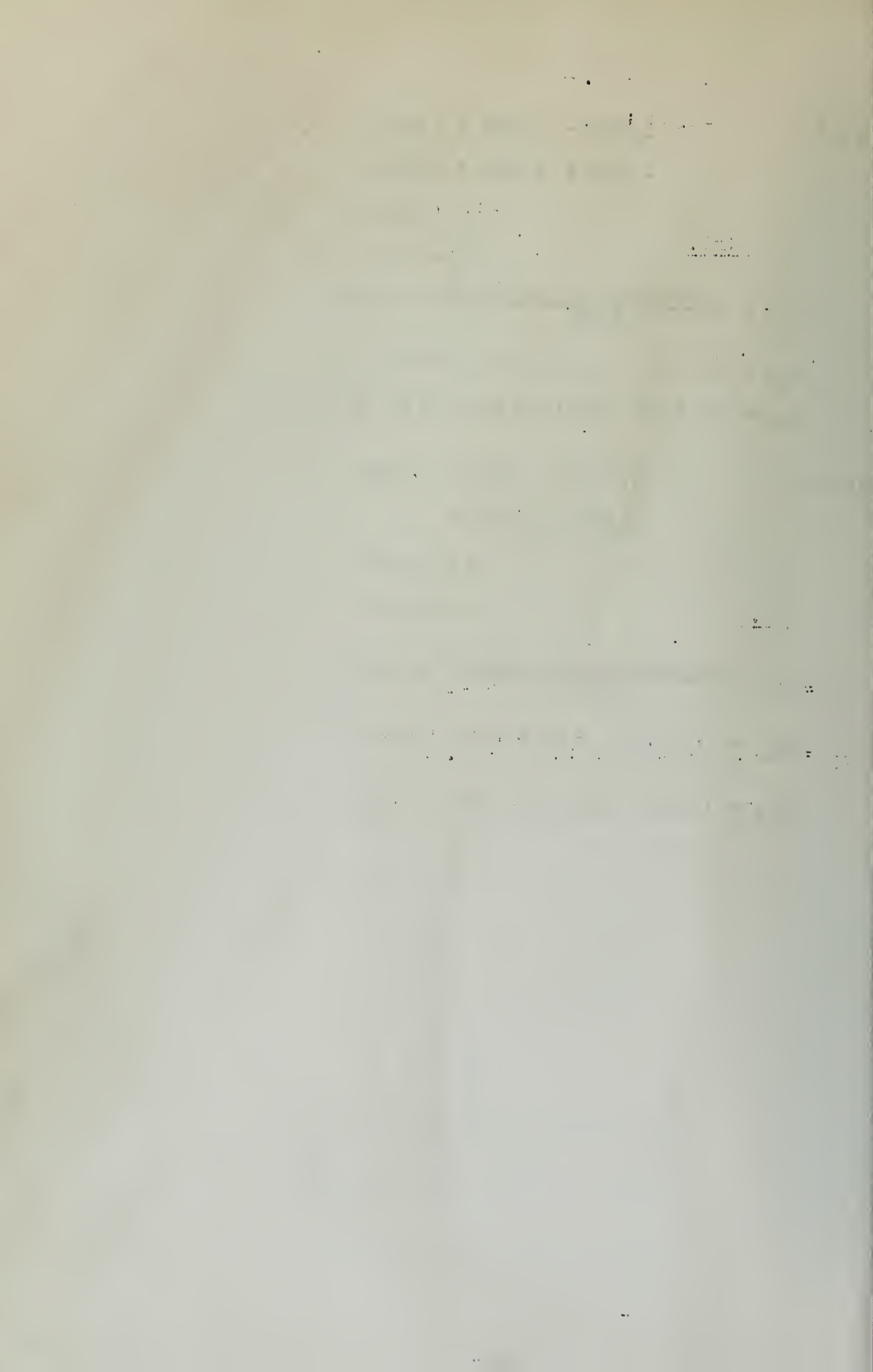
$$H = -1.02$$

$$I = -0.10$$

$$R_8 = \frac{-2.83 \times 1.02 - 2.91 \times .10}{3.83} = -.83$$

$$M_{HI} = 1(-1.02 - \frac{1}{2} \times .10 + .83) = -.24$$

$$M_{IH} = 1(-.10 - \frac{1}{2} \times 1.02 + .83) = .22$$



$$\begin{aligned}\text{Panel 1} \quad & 1.82A - .17B = 0 \\ & -.26A + 1.76B = -.92 \\ & A = -.05 \quad B = -.53\end{aligned}$$

$$R_1 = \frac{-2.91 \times .05 - 2.83 \times .53}{3.83} = -.43$$

$$M_{AB} = 1(-.05 - \frac{1}{2} \times .53 + .43) = .11$$

$$M_{BA} = 1(-.53 - \frac{1}{2} \times .05 + .43) = -.11$$

$$\begin{aligned}\text{Panel 2} \quad & 1.78B + .20C = .72 \\ & -.26B + 1.76C = -.85 \\ & B = -.46 \quad C = -.55\end{aligned}$$

$$R_2 = \frac{-2.96 \times .46 - 2.91 \times .55}{3.91} = -.76$$

$$M_{BC} = 1(-.46 - \frac{1}{2} \times .55 + .76) = .02$$

$$M_{CB} = 1(-.55 - \frac{1}{2} \times .46 + .76) = -.02$$

$$\begin{aligned}\text{Panel 3} \quad & 1.78C - .21D = .98 \\ & -.26C + 1.76D = .06 \\ & C = .56 \quad D = .12\end{aligned}$$

$$R_3 = \frac{2.95 \times .56 + 2.90 \times .12}{3.90} = .57$$

$$M_{CD} = 1(.56 + \frac{1}{2} \times .12 - .51) = .11$$

$$M_{DC} = 1(.12 + \frac{1}{2} \times .56 - .51) = -.11$$

$$\begin{aligned}\text{Panel 4} \quad & 1.75D - .25E = .89 \\ & -.25D + 1.75E = .03 \\ & D = .52 \quad E = .09\end{aligned}$$

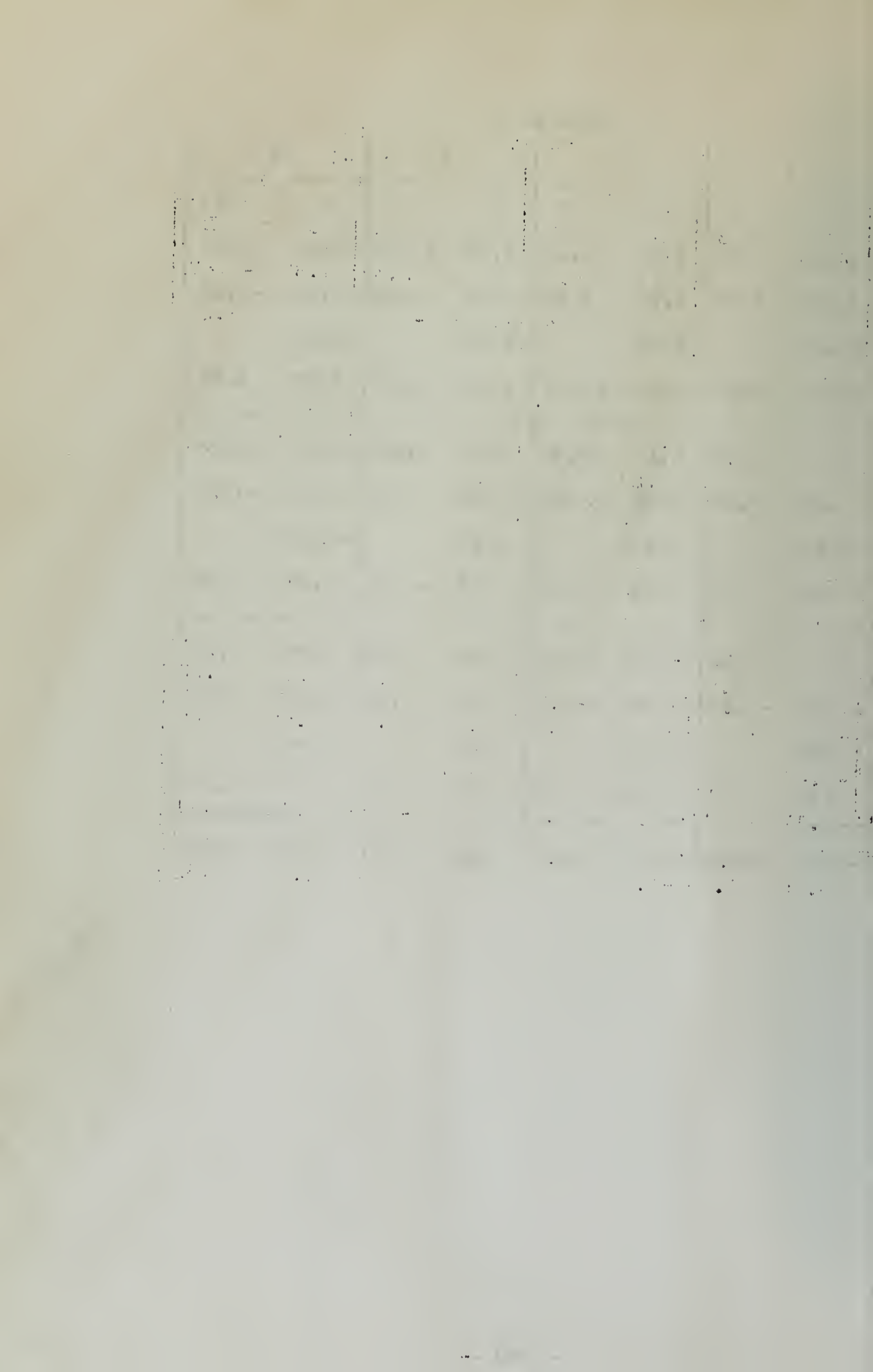
$$R_4 = 3/4(.52 + .09) = .46$$

$$M_{DE} = 1(.52 + \frac{1}{2} \times .09 - .46) = .11$$

$$M_{ED} = 1(.09 + \frac{1}{2} \times .52 - .46) = -.11$$

Load at C

| Panel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| Q | 4.89 | 5.38 | 4.96 | 5.23 | -2.36 | -2.38 | -1.87 | -1.87 |
| x | 3.01 | 3.50 | 3.20 | 3.44 | -1.51 | -1.58 | -1.25 | -1.25 |
| R | 10.27 | | 10.21 | | -4.70 | | -3.74 | |
| M' | -5.41 | -5.27 | -5.29 | -5.17 | 2.40 | 2.37 | 1.87 | 1.87 |
| Q | 0 | 5.29 | 5.27 | -2.40 | 5.17 | -1.87 | -2.37 | -1.88 |
| x | .29 | 3.04 | 2.85 | -.94 | 2.82 | -.65 | -1.54 | -1.30 |
| R | 2.46 | | 1.46 | | 1.65 | | -2.13 | |
| M' | -.65 | .72 | .92 | -.98 | .85 | -.89 | -.06 | .06 |
| Q | 0 | -.92 | -.72 | -.85 | .98 | .06 | .89 | .03 |
| x | -.05 | -.53 | -.46 | -.55 | .56 | .12 | .52 | .09 |
| R | -.43 | | -.76 | | .51 | | .46 | |
| M'' | .11 | -.11 | .02 | -.02 | .11 | -.11 | .11 | -.11 |
| M | -6.05 | -4.65 | -4.35 | -6.17 | 3.36 | 1.37 | 1.92 | 1.82 |



| 5 | | 6 | | 7 | | 8 | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| L | F | F | G | G | H | H | I |
| -1.88 | -1.88 | -1.64 | -1.56 | -1.74 | -1.66 | -1.80 | -1.62 |
| -1.26 | -1.26 | -1.08 | -1.00 | -1.14 | -1.06 | -1.18 | -1.10 |
| -3.76 | | -3.20 | | -3.40 | | -3.42 | |
| 1.88 | 1.88 | 1.62 | 1.66 | 1.74 | 1.78 | 1.74 | 1.86 |
| -1.87 | -1.62 | -1.88 | -1.74 | -1.66 | -1.74 | -1.78 | 0 |
| -1.23 | -1.10 | -1.22 | -1.12 | -1.10 | -1.10 | -1.02 | - .10 |
| -1.75 | | -1.75 | | -1.65 | | - .83 | |
| - .03 | .03 | - .03 | .02 | 0 | 0 | - .24 | .22 |
| - .06 | .03 | - .03 | 0 | - .02 | .24 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.85 | 1.91 | 1.59 | 1.68 | 1.74 | 1.78 | 1.50 | 2.08 |

Influence Line Corrections - First Set

Panel 1

Load at D

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 4.41$$

$$A = .24$$

$$B = 2.54$$

$$R_1 = 2.06$$

$$M_{AB} = (.24 + \frac{2.54}{2} - 2.06) = -.57$$

$$M_{BA} = (2.54 + \frac{.24}{2} - 2.06) = -.59$$

Panel 2

$$1.78B - .21C = 4.40$$

$$-.26B + 1.76C = 4.17$$

$$B = 2.80$$

$$C = 2.78$$

$$R_2 = 4.18$$

$$M_{BC} = (2.80 + \frac{2.78}{2} - 4.18) = 0$$

$$M_{CB} = (2.78 + \frac{2.80}{2} - 4.18) = 0$$

Panel 3

$$1.78C - .21D = 4.31$$

$$-.26C + 1.76D = -2.82$$

$$C = 2.27$$

$$D = -1.27$$

$$R_3 = .78$$

$$M_{CD} = (2.27 - \frac{1.27}{2} - .78) = .86$$

$$M_{DC} = (-1.27 + \frac{2.27}{2} - .78) = -.92$$

Panel 4

$$1.75D - .25E = 4.07$$

$$-.25D + 1.75E = -2.82$$

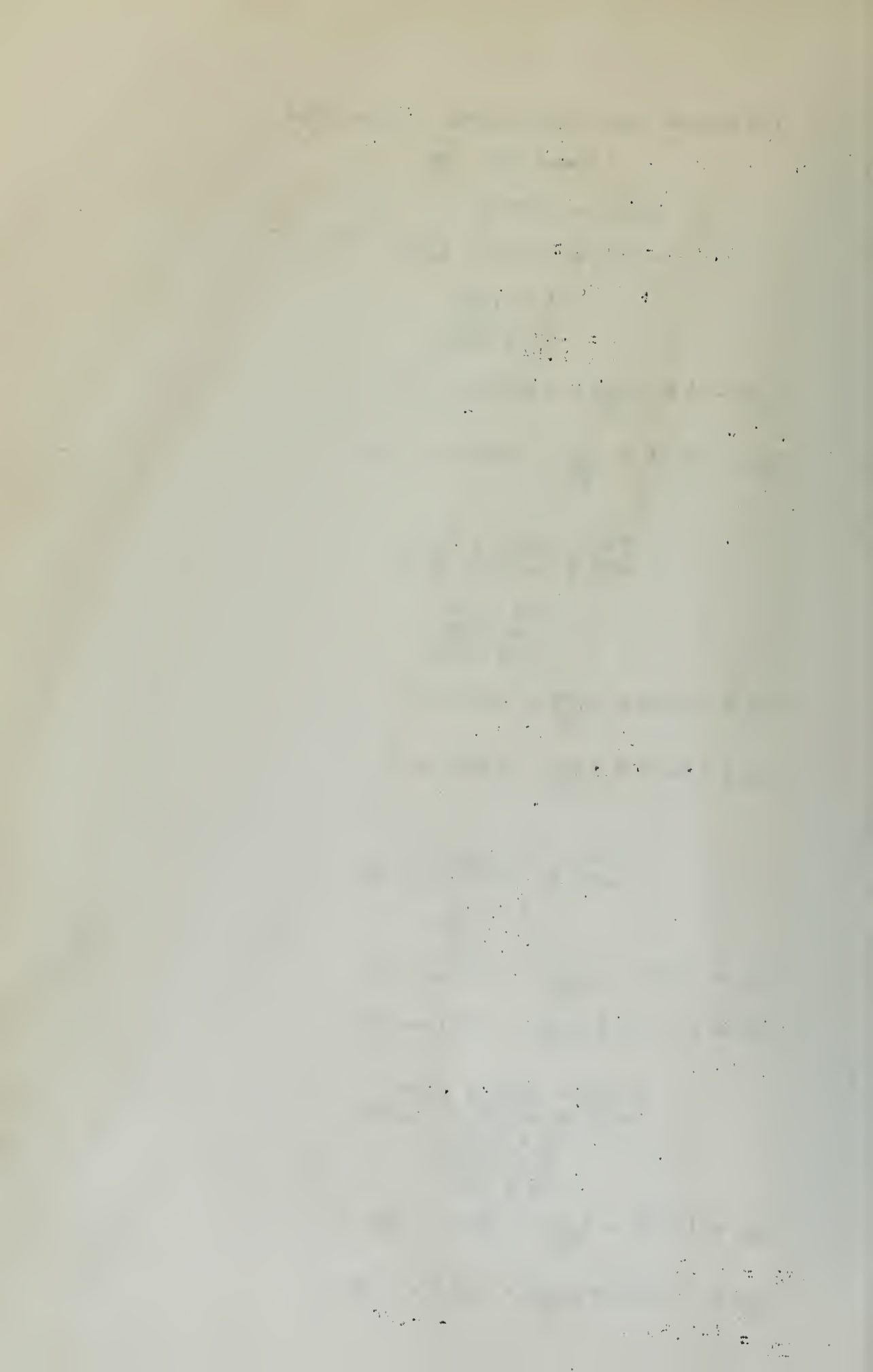
$$D = 2.14$$

$$E = -1.30$$

$$R_4 = .63$$

$$M_{DE} = (2.14 - \frac{1.30}{2} - .63) = .86$$

$$M_{ED} = (-1.30 + \frac{2.14}{2} - .63) = -.86$$



anel 5

$$\begin{aligned}-.25F + 1.75E &= -2.82 \\ 1.75F - .25E &= -2.43\end{aligned}$$

$$\begin{aligned}E &= -1.85 \\ F &= -1.65 \\ R_5 &= -2.63\end{aligned}$$

$$M_{EF} = (-1.85 - \frac{1.65}{2} + 2.63) = -.04$$

$$M_{FE} = (-1.65 - 1.85 + 2.63) = .06$$

anel 6

$$\begin{aligned}-.26G + 1.76F &= -2.82 \\ 1.78G - .21F &= -2.61\end{aligned}$$

$$\begin{aligned}F &= -1.85 \\ G &= -1.69 \\ R_6 &= -2.66\end{aligned}$$

$$M_{FG} = (-1.85 - \frac{1.69}{2} + 2.66) = -.03$$

$$M_{GF} = (-1.69 - \frac{1.85}{2} + 2.66) = .05$$

anel 7

$$\begin{aligned}-.26H + 1.76G &= -2.49 \\ 1.78H - .21G &= -2.61\end{aligned}$$

$$\begin{aligned}G &= -1.66 \\ H &= -1.66 \\ R_7 &= -2.49\end{aligned}$$

$$M_{GH} = (-1.66 - \frac{1.66}{2} + 2.49) = 0$$

$$M_{HG} = (-1.66 - \frac{1.66}{2} + 2.49) = 0$$

anel 8

$$\begin{aligned}-.26I + 1.76H &= -2.67 \\ 1.82I - .17H &= 0\end{aligned}$$

$$\begin{aligned}H &= -1.54 \\ I &= -.14 \\ R_8 &= -1.25\end{aligned}$$

$$M_{HI} = (-1.54 - \frac{.14}{2} + 1.25) = -.36$$

$$M_{IH} = (-.14 - \frac{1.54}{2} + 1.25) = .34$$

Influence Line Corrections-Load at D

Second Set

nel 1 0

nel 2

$$1.78B - .21C = .59$$

$$-.26B + 1.76C = -.86$$

$$B = -.40$$

$$C = -.55$$

$$R_2 = -.71$$

$$M_{BC} = (-.40 - \frac{.55}{2} + .71) = .04$$

$$M_{CB} = (-.55 - \frac{.40}{2} + .71) = -.04$$

nel 3

$$1.78C - .21D = 0$$

$$-.26C + 1.76D = -.86$$

$$C = -.06$$

$$D = -.50$$

$$R_3 = -.42$$

$$M_{CD} = (-.06 - \frac{.50}{2} + .42) = .11$$

$$M_{DC} = (-.50 - \frac{.06}{2} + .42) = -.11$$

nel 4

$$1.75D - .25E = .92$$

$$-.25D + 1.75E = .04$$

$$D = .54$$

$$E = .10$$

$$R_4 = .43$$

$$M_{DE} = (.54 + \frac{.10}{2} - .43) = .11$$

$$M_{ED} = (.10 + .54 - .43) = .11$$

Panel 5

$$-.25F + 1.75E = .86$$

$$1.75F - .25E = .03$$

$$E = .50$$

$$F = .09$$

$$R_5 = .44$$

$$M_{EF} = (.50 + \frac{.09}{2} - .44) = .10$$

$$M_{FE} = (.09 + \frac{.50}{2} - .44) = -.10$$

Panel 6

$$-.26G + 1.76F = -.06$$

$$1.78G - .21F = 0$$

$$F = -.35 \quad G = 0$$

$$M_{FG} = (-.35 - 0 + .26) = -.09$$

$$M_{GF} = (0 - .35 + .26) = .09$$

Panel 7

$$-.26H + 1.76G = -.03$$

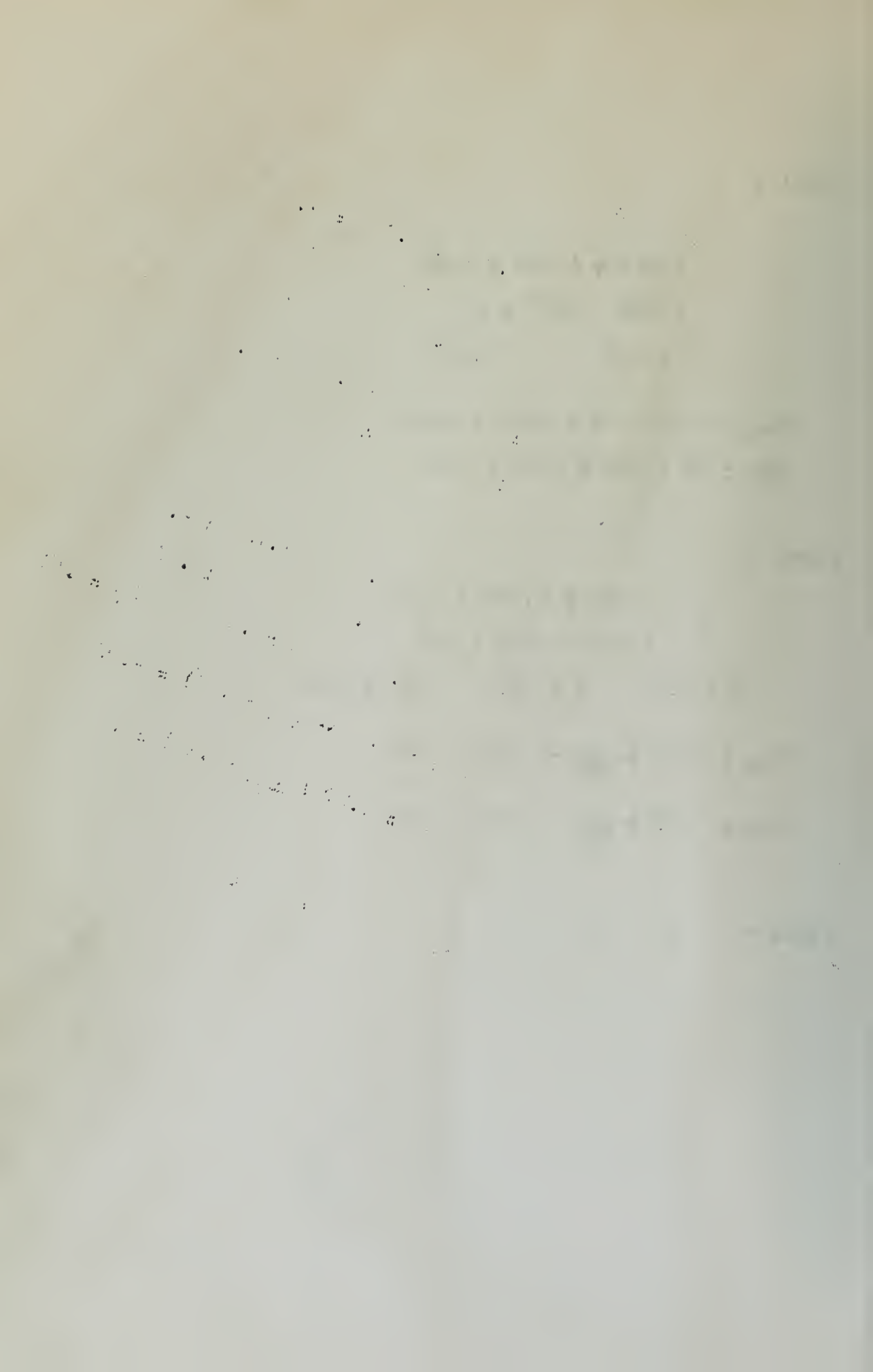
$$1.78H - .21G = .36$$

$$G = .01 \quad H = .20 \quad R_7 = .16$$

$$M_{GH} = (.01 + \frac{.20}{2} - .16) = -.05$$

$$M_{HG} = (.20 + \frac{.01}{2} - .16) = .04$$

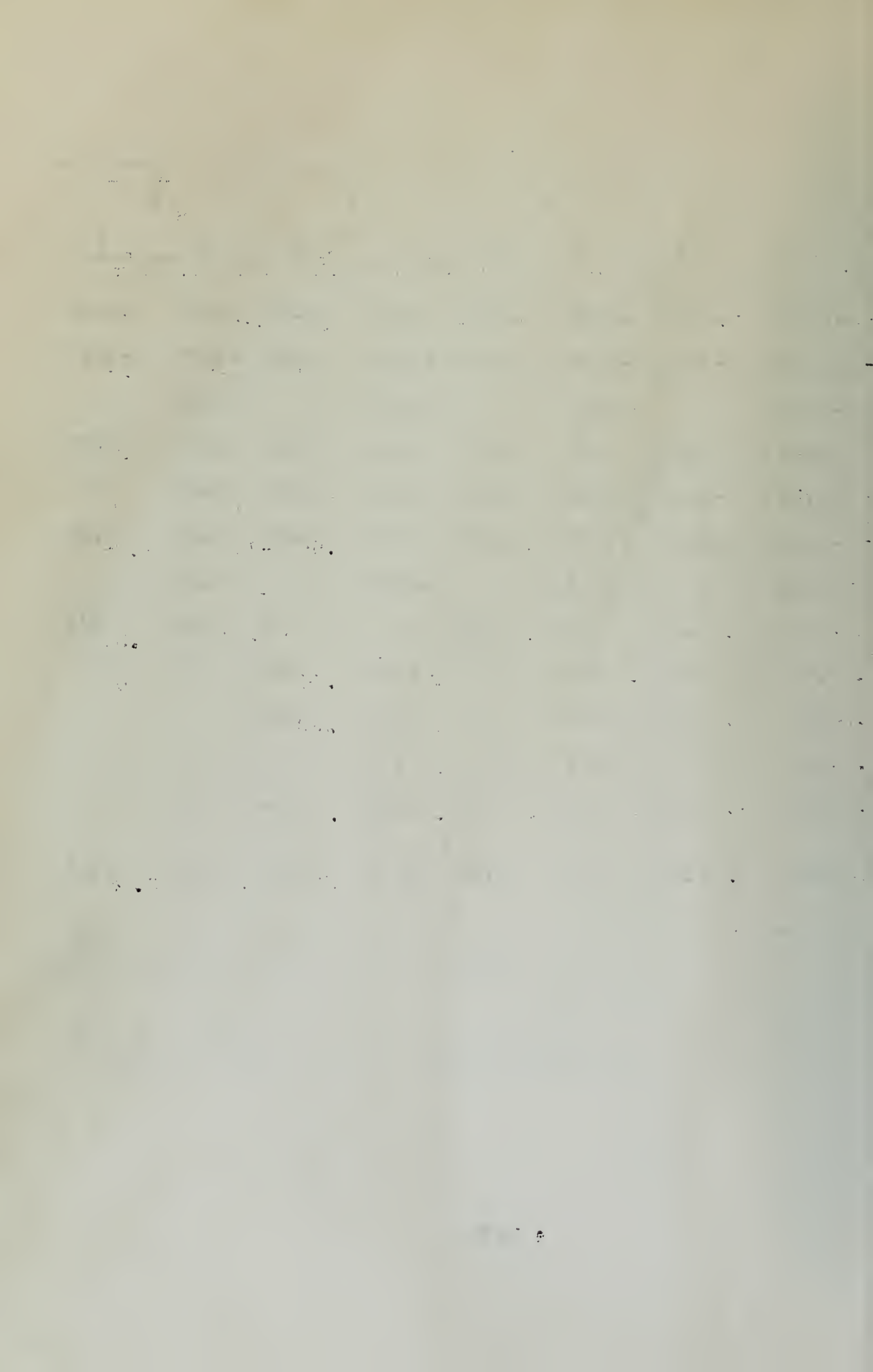
Panel 8 = 0



LOAD AT D

| Panel
Point | 1 | | 2 | | 3 | | 4 | |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | A | B | B | C | C | D | D | E |
| -Q | 4.12 | 4.49 | 4.14 | 4.36 | 3.91 | 4.12 | 2.82 | -2.82 |
| | 2.54 | 2.92 | 2.67 | 2.87 | 2.52 | 2.71 | -1.88 | -1.88 |
| R | 8.59 | | 8.51 | | 8.04 | | -5.64 | |
| M' | -4.59 | -4.40 | -4.41 | -4.31 | -4.17 | -4.07 | 2.82 | 2.82 |
| -Q | 0 | 4.41 | 4.40 | 4.17 | 4.31 | -2.82 | 4.07 | -2.82 |
| | .24 | 2.54 | 2.80 | 2.78 | 2.27 | -1.27 | 2.14 | -1.30 |
| R | 2.06 | | 4.18 | | .78 | | .63 | |
| M'' | -.57 | .59 | 0 | 0 | .86 | -.92 | .86 | -.86 |
| -Q | 0 | 0 | -.59 | -.86 | 0 | -.86 | .92 | .04 |
| | | | -.40 | -.55 | -.06 | -.50 | .54 | .10 |
| R | | | -.71 | | -.42 | | .48 | |
| M'' | 0 | 0 | .04 | -.04 | .11 | -.11 | .11 | -.11 |
| M | -5.16 | -3.81 | -4.37 | -4.35 | -3.20 | -5.10 | 3.79 | 1.85 |

| Panel | 5 | | 6 | | 7 | | 8 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Point | E | F | F | G | G | H | H | I |
| -Q | -2.82 | -2.82 | -2.46 | -2.34 | -2.61 | -2.49 | -2.70 | -2.43 |
| Q | -1.89 | -1.82 | -1.62 | -1.50 | -1.71 | -1.59 | -1.77 | -1.50 |
| R | -5.34 | | -4.80 | | -5.10 | | -5.13 | |
| M' | 2.82 | 2.82 | 2.43 | 2.49 | 2.61 | 2.67 | 2.61 | 2.79 |
| -Q | -2.82 | -2.43 | -2.32 | -2.61 | -2.49 | -2.61 | -2.67 | 0 |
| Q | -1.85 | -1.65 | -1.69 | -1.85 | -1.66 | -1.66 | -1.54 | -.14 |
| R | -2.63 | | -2.56 | | -2.49 | | -1.25 | |
| M'' | -.04 | .06 | -.03 | .05 | 0 | 0 | -.36 | .34 |
| -Q | .86 | .05 | -.06 | 0 | -.03 | .36 | 0 | 0 |
| Q | .50 | .09 | -.35 | 0 | .01 | .20 | | |
| R | .44 | | -.26 | | .15 | | | |
| M'' | .10 | -.10 | -.09 | .09 | -.05 | .04 | 0 | 0 |
| Σ M | 2.88 | 2.78 | 2.33 | 2.61 | 2.53 | 2.71 | 2.25 | 3.13 |



Influence Line Corrections-Load at E
First Set

Panels 1,8

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 3.53$$

$$A = -.19 \quad B = 2.03 \quad R_1 = 1.65$$

$$M_{AB} = (.19 + \frac{2.03}{2} - 1.65) = -.45$$

$$M_{BA} = (2.03 + \frac{.19}{2} - 1.65) = .47$$

Panel 2,7

$$1.78B - .21C = 3.48$$

$$-.26B + 1.76C = 3.24$$

$$B = 2.21 \quad C = 2.17 \quad R_2 = 3.28$$

$$M_{BC} = (2.21 + \frac{2.17}{2} - 3.28) = .01$$

$$M_{CB} = (2.17 + \frac{2.21}{2} - 3.28) = -.01$$

Panels 3,6

$$1.78C - .21D = 3.45$$

$$-.26C + 1.76D = 3.76$$

$$C = 2.23 \quad D = 2.46 \quad R_3 = 3.52$$

$$M_{CD} = (2.23 + \frac{2.46}{2} - 3.52) = -.06$$

$$M_{DC} = (2.46 + \frac{2.23}{2} - 3.52) = .05$$

Panels 4,5

$$1.75D - .25E = 3.24$$

$$-.25D + 1.75E = -3.76$$

$$D = 1.58 \quad E = -1.92 \quad R_4 = -.25$$

$$M_{DE} = (1.58 + \frac{1.92}{2} + .25) = .87$$

$$M_{ED} = (-1.92 + \frac{1.58}{2} + .25) = -.88$$

Influence Line Corrections-Load at E
Second Set

panels 1,8

0

panels 2,7

$$1.78B - .21C = -.47$$

$$-.26B + 1.76C = .06$$

$$B = -.26 \quad C = -.01 \quad R_2 = -.20$$

$$M_{BC} = (.01 - \frac{.26}{2} + .20) = .06$$

$$M_{CB} = (-.01 - .26 + 2.0) = .06$$

panels 3,6

$$1.75C - .21D = .01$$

$$-.26C + 1.76D = -.87$$

$$C = -.05 \quad D = -.50 \quad R_3 = -.41$$

$$M_{CD} = (.05 - \frac{.50}{2} + .41) = .11$$

$$M_{DC} = (-.50 - \frac{.05}{2} + .41) = -.11$$

panels 4,5

$$1.75D - .25E = -.05$$

$$-.25D + 1.75E = -.88$$

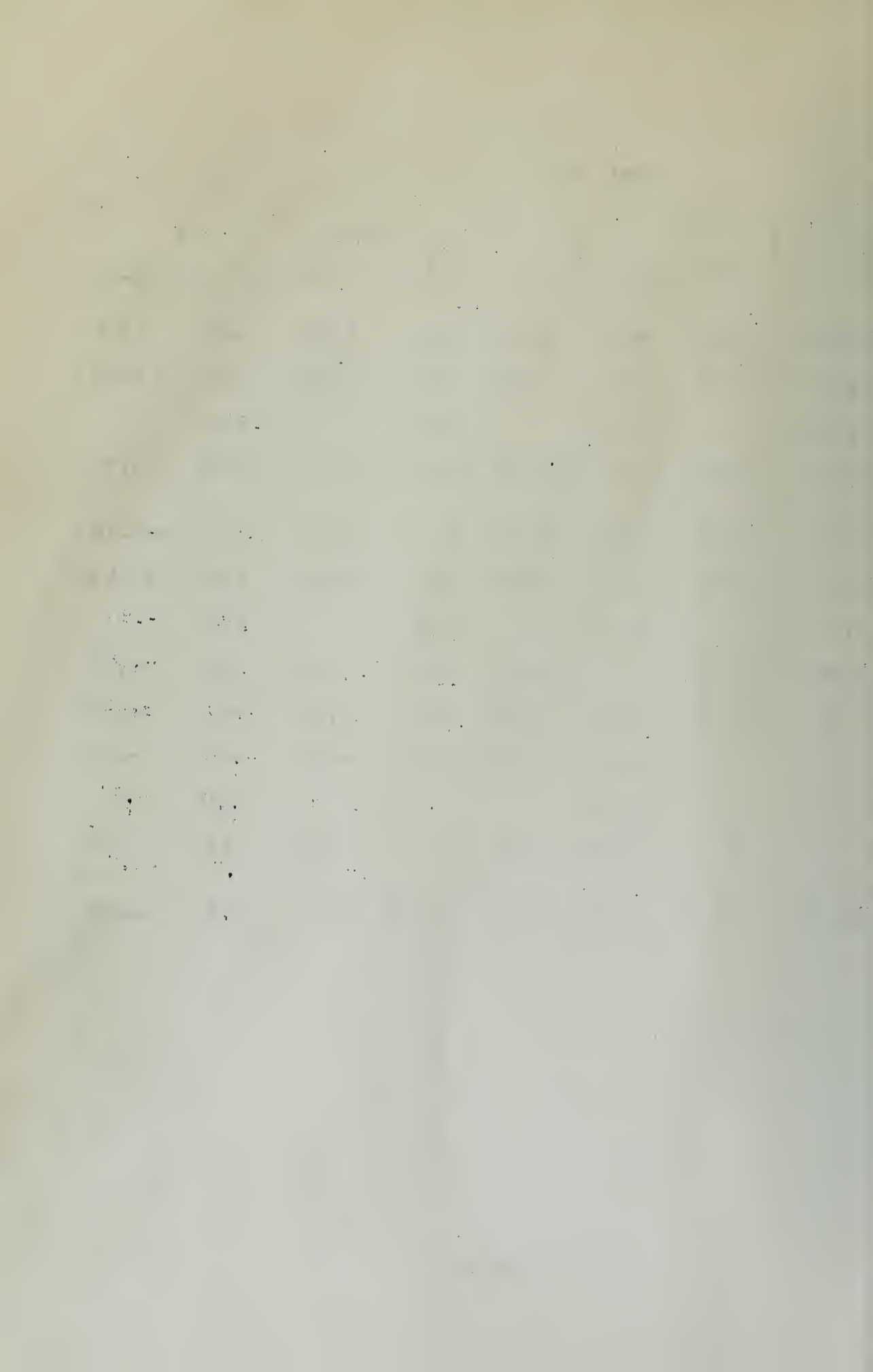
$$D = -.10 \quad E = -.52 \quad R_4 = -.46$$

$$M_{DE} = (-.10 - \frac{.52}{2} + .46) = .10$$

$$M_{ED} = (-.52 - \frac{.10}{2} + .46) = -.11$$

Load at E

| Inel
Point | 1 | | 2 | | 3 | | 4 | |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | A | B | B | C | C | D | D | E |
| | 3.24 | 3.60 | 3.32 | 3.48 | 3.12 | 3.28 | 3.76 | 3.76 |
| | 2.00 | -2.36 | 2.12 | 2.28 | 2.00 | 2.16 | 2.52 | 2.52 |
| | 6.84 | | 6.81 | | 6.40 | | 7.52 | |
| | -3.72 | -3.48 | -3.53 | -3.45 | -3.24 | -3.24 | -3.76 | -3.76 |
| | 0 | 3.53 | 3.48 | 3.24 | 3.45 | 3.76 | 3.24 | -3.76 |
| | .19 | 2.03 | 2.31 | 2.17 | 2.23 | 2.46 | 1.58 | -1.92 |
| | 1.65 | | 3.28 | | 3.52 | | -.25 | |
| | -.45 | .47 | .01 | -.01 | -.06 | .05 | .87 | -.88 |
| | 0 | -.01 | -.47 | .06 | .01 | -.87 | -.05 | -.88 |
| | | | -.26 | -.01 | -.05 | -.50 | -.10 | -.52 |
| | | | -.20 | | -.41 | | -.46 | |
| | | | -.06 | .06 | .11 | -.11 | .10 | -.11 |
| | -4.17 | -3.01 | -3.58 | -3.40 | -3.19 | -3.30 | -2.79 | -4.75 |



Moment Computations

Member AA' DL = 3422 fk
 LL E-60 = 3005
 Impact = 643
 Total 7070

LL H15-S12-44 = 401
 Conc. = 91
 Impact = 68
 Total 560

Sidewalk = 259

Design Moment = 7,869 fk

Member BB' DT = 4680 fk
 LL E-60 = 3990
 Impact = 835
 Total 9505

LL H15-S12-44 = 548
 Conc. = 128
 Impact = 93
 Total 769

Sidewalk = 326

Design Moment = 10,600 fk

Member CC' DL = 3230 fk
 LL E-60 = 2945
 Impact = 728
 Total 6903

LL H15-S12-44 = 384
 Conc. = 115
 Impact = 82
 Total 581

Sidewalk = 247

Design Moment = 7,781 fk

| nel
Int | 5 | | 6 | | 7 | | 8 | |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | E | F | F | G | G | H | H | I |
| -Q | -3.76 | -3.76 | -3.28 | -3.12 | -3.48 | -3.32 | -3.60 | -3.24 |
| C | -2.52 | -2.52 | -2.16 | -2.00 | -2.28 | -2.12 | -2.36 | -2.00 |
| R | -7.52 | | -6.40 | | -6.81 | | -6.84 | |
| M' | 3.76 | 3.76 | 3.24 | 3.24 | 3.45 | 3.53 | 3.48 | 3.72 |
| -Q | 3.76 | -3.23 | -3.76 | -3.45 | -3.24 | -3.48 | -3.53 | 0 |
| | 1.92 | -1.58 | -2.46 | -2.23 | -2.17 | -2.21 | -2.03 | -.19 |
| R | .25 | | -3.52 | | -3.28 | | -1.65 | |
| M'' | .88 | -.87 | -.05 | .06 | .01 | -.01 | -.47 | .45 |
| Q | .88 | .05 | .87 | -.01 | -.06 | .47 | .01 | 0 |
| C | .52 | .10 | .50 | .05 | .01 | .26 | | |
| R | .46 | | .41 | | .20 | | | |
| M''' | .11 | -.10 | .11 | -.11 | -.06 | .06 | 0 | 0 |
| M | 4.75 | 2.79 | 3.30 | 3.19 | 3.40 | 3.58 | 3.01 | 4.17 |
| | | | | | | | | |
| | | | | | | | | |

Member DL'

| | | | |
|---------------|---|------------|----|
| DL | = | 2132 | fk |
| LL-E60 | = | 1950 | |
| Impact | = | <u>536</u> | |
| Total | = | 4618 | |
| LL-H15-S12-44 | = | 240 | |
| Conc. | = | 88 | |
| Impact | = | <u>53</u> | |
| Total | = | 381 | |
| Sidewalk | = | 171 | |
| Design Moment | = | 5,170 | fk |

Member EE'

| | | | |
|---------------|---|------------|----|
| DL | = | 1267 | fk |
| LL-E60 | = | 1213 | |
| Impact | = | <u>425</u> | |
| Total | = | 2905 | |
| Sidewalk | = | 114 | |
| Design Moment | = | 3,282 | fk |

Member AB

| | | |
|---------------|--------------|----|
| DL | = 3422 | fk |
| LL-E60 | = 5005 | |
| Impact | = <u>643</u> | |
| Total | = 7070 | |
| LL-H15-S12-44 | = 401 | |
| Conc. | = 91 | |
| Impact | = <u>68</u> | |
| Total | = 560 | |
| Sidewalk | = 239 | |
| Design Moment | = 7,689 | fk |

Member BC

| | | |
|---------------|--------------|----|
| DL | = 2326 | fk |
| LL-E60 | = 2092 | |
| Impact | = <u>481</u> | |
| Total | = 4849 | |
| LL-H15-S12-44 | = 272 | |
| Conc. | = 75 | |
| Impact | = <u>52</u> | |
| Total | = 397 | |
| Sidewalk | = 169 | |
| Design Moment | = 5,465 | fk |

Member CD

| | | | |
|---------------|---|------------|----|
| DL | = | 1666 | fk |
| LL-E60 | = | 1551 | |
| Impact | = | <u>398</u> | |
| Total | = | 3615 | |
| LL-H15-H12-44 | = | 195 | |
| Conc. | = | 64 | |
| Impact | = | <u>44</u> | |
| Total | = | 303 | |
| Sidewalk | = | 125 | |
| Design Moment | = | 4,043 | fk |

Member DE

| | | | |
|---------------|---|------------|----|
| DL | = | 1192 | fk |
| LL-E60 | = | 1150 | |
| Impact | = | <u>345</u> | |
| Total | = | 2687 | |
| LL-H15-S12-44 | = | 140 | |
| Conc. | = | 56 | |
| Impact | = | <u>57</u> | |
| Total | = | 233 | |
| Sidewalk | = | 100 | |
| Design Moment | = | 3,020 | fk |

Influence Line Computations - Fourth Set

Load at B

Panel 1

$$-Q_A = \frac{(.0942 - 4)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)4} = 6.14$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28$$

$$Q_{R1} = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)4} = 1.57$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)4} = -1.20$$

$$-Q_C = \frac{(-.125 \times 30 - 22.5 \times .0443)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{(-.125 \times 30 - 22.5 \times .0443)}{2(2 - .0443)4} = -.30$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)3} = -1.16$$

$$-Q_D = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)3} = -.40$$

Panel 4

$$-Q_D = \frac{-2(.125 \times 30)}{4 \times 2} = -.94$$

$$-Q_E = \frac{(-.125 \times 30)}{4} = -.94$$

$$Q_{R4} = \frac{(-.125 \times 30)}{4 \times 2} = -.47$$

$$x_{n+1} = \frac{(x_n^2 + y_n^2) - (x_n^2 - y_n^2)}{2} = \frac{2y_n^2}{2} = y_n^2$$

$$y_{n+1} = \frac{(x_n^2 + y_n^2) + (x_n^2 - y_n^2)}{2} = \frac{2x_n^2}{2} = x_n^2$$

Thus, the sequence (x_n, y_n) is defined by

$$x_{n+1} = y_n^2, \quad y_{n+1} = x_n^2$$

$$x_0 = 1, \quad y_0 = 1$$

$$x_1 = 1, \quad y_1 = 1$$

$$x_2 = 1, \quad y_2 = 1$$

$$x_3 = 1, \quad y_3 = 1$$

$$x_4 = 1, \quad y_4 = 1$$

$$x_5 = 1, \quad y_5 = 1$$

$$x_6 = 1, \quad y_6 = 1$$

$$x_7 = 1, \quad y_7 = 1$$

Panel 5

$$-Q_E = \frac{-.125 \times 30}{4} = -0.94$$

$$-Q_T = \frac{-.125 \times 30}{4} = -0.94$$

$$Q_{R5} = \frac{-.125 \times 30}{4 \times 2} = -0.47$$

Panel 6

$$-Q_T = \frac{(-.125 \times 30 + .0482 \times 30)}{2(2 - .0482)} = -0.82$$

$$-Q_G = \frac{(.0507 \times 2 - 3)(-.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)3} = -0.79$$

$$Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)3} = -0.27$$

Panel 7

$$-Q_G = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)} = -0.87$$

$$-Q_H = \frac{(.0463 \times 1 - 4)(-.0443 \times 7.5 + .125 \times 30)}{2(2 - .0443)4} = -0.86$$

$$Q_{R7} = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)4} = -0.22$$

Panel 8

$$-Q_H = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -0.90$$

$$-Q_I = \frac{(.0942 \times 1 - 4)(-.0866 \times 3.75 + .125 \times 30)}{2(2 - .0866)4} = -0.88$$

$$Q_{R8} = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)4} = -0.22$$

Load at C

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)4} = 5.27$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)4} = 1.35$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)4} = 5.17$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)4} = 1.31$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)3} = -2.31$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)3} = -.79$$

Panel 4

$$-Q_D = \frac{-2(.25 \times 30)}{4 \times 2} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30)}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4 \times 2} = -.94$$

1. The first part of the paper is devoted to a general discussion of the problem.

2. In the second part, we shall consider the case of a single particle.

3. The third part is devoted to the case of a system of particles.

4. In the fourth part, we shall discuss the results of our calculations.

5. The fifth part is devoted to a discussion of the experimental results.

6. In the sixth part, we shall discuss the conclusions of our work.

7. Finally, we shall give some references.

8. The first part of the paper is devoted to a general discussion of the problem.

9. In the second part, we shall consider the case of a single particle.

10. The third part is devoted to the case of a system of particles.

11. In the fourth part, we shall discuss the results of our calculations.

12. The fifth part is devoted to a discussion of the experimental results.

13. In the sixth part, we shall discuss the conclusions of our work.

Panel 5

$$-Q_T = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -0.94$$

Panel 6

$$-Q_T = -1.64$$

$$-Q_G = -1.58$$

$$Q_{R6} = -0.54$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.72$$

$$Q_{R7} = -0.44$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.76$$

$$Q_{R8} = -0.45$$

Load at D

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)4} = 4.38$$

$$-Q_B = \frac{(.625 \times 30 - .0866 \times 18.75)}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{(.625 \times 30 - .0866 \times 18.75)}{2(2 - .0866)4} = 1.12$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)4} = 4.31$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)4} = 1.09$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)3} = 3.98$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)3} = 1.37$$

Panel 4

$$-Q_D = \frac{-2(.375 \times 30)}{4 \times 2} = -2.82$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.82$$

$$Q_{R4} = \frac{(-.375 \times 30)}{4 \times 2} = -1.41$$

Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R_5} = -1.41$$

Panel 6

$$-Q_I = -2.46$$

$$-Q_G = -2.37$$

$$Q_{R_6} = -0.81$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.58$$

$$Q_{R_7} = -0.66$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.64$$

$$Q_{R_8} = -0.67$$

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Load at E

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)4} = 3.51$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)} = 3.59$$

$$Q_{R_1} = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)4} = .90$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)4} = 3.44$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R_2} = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)4} = .87$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)3} = 3.18$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

$$Q_{R_3} = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)3} = 1.10$$

Panel 4

$$-Q_D = \frac{-2(-.5 \times 30)}{4 \times 2} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R_4} = \frac{(.5 \times 30)}{4 \times 2} = 1.88$$

Panel 5

$$-Q_E = -3.76$$

$$-Q_F = -3.76$$

$$Q_{R_5} = -1.88$$

Panel 6

$$-Q_F = -3.28$$

$$-Q_G = -3.16$$

$$Q_{R_6} = -1.08$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.44$$

$$Q_{R_7} = -0.88$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.52$$

$$Q_{R_8} = -0.90$$

Determination of formulae for Panel Constant Computations

el 1

$$5 + 4 + \left[\frac{(3 - .0866)(.0942 - 4)}{2(2 - .0866)} \right] A + \left[2 + \frac{(3 - .1732)(.0942 - 4)}{2(2 - .0866)} \right] B = -Q_A$$

$$2.52A - .90B = -Q_A$$

$$1.5 - \left[\frac{(3 - .1732)4}{2(2 - .0866)} \right] B + \left[2 - \frac{(3 - .0866)4}{2(2 - .0866)} \right] A = -Q_B$$

$$2.54B - 1.04A = -Q_B$$

el 2

$$5 + 4 + \left[\frac{(3 - .0443)(.0463 - 4)}{2(2 - .0443)} \right] A + \left[2 + \frac{(3 - .0886)(.0463 - 4)}{2(2 - .0443)} \right] B = -Q_A$$

$$2.52A - .93B = -Q_A$$

$$3 - \left[\frac{(3 - .0886)4}{2(2 - .0443)} \right] B + \left[2 - \frac{(3 - .0443)4}{2(2 - .0443)} \right] A = -Q_B$$

$$4.03B - 1.02A = -Q_B$$

nel 3

$$5x2 + 3 + \left[\frac{(3 - .0482)(.0507x2-3)}{2(2 - .0482)} \right] A + \left[1.5 + \frac{(3 - .0946)(.0507x2-3)}{2(2 - .0482)} \right] B = -Q_A$$

$$3.31A - .65B = -Q_A$$

$$4.5 - \left[\frac{(3 - .0946)3}{2(2 - .0482)} \right] B + \left[1.5 - \frac{(3 - .0482)3}{2(2 - .0482)} \right] A = -Q_B$$

$$5.26B - .77A = -Q_B$$

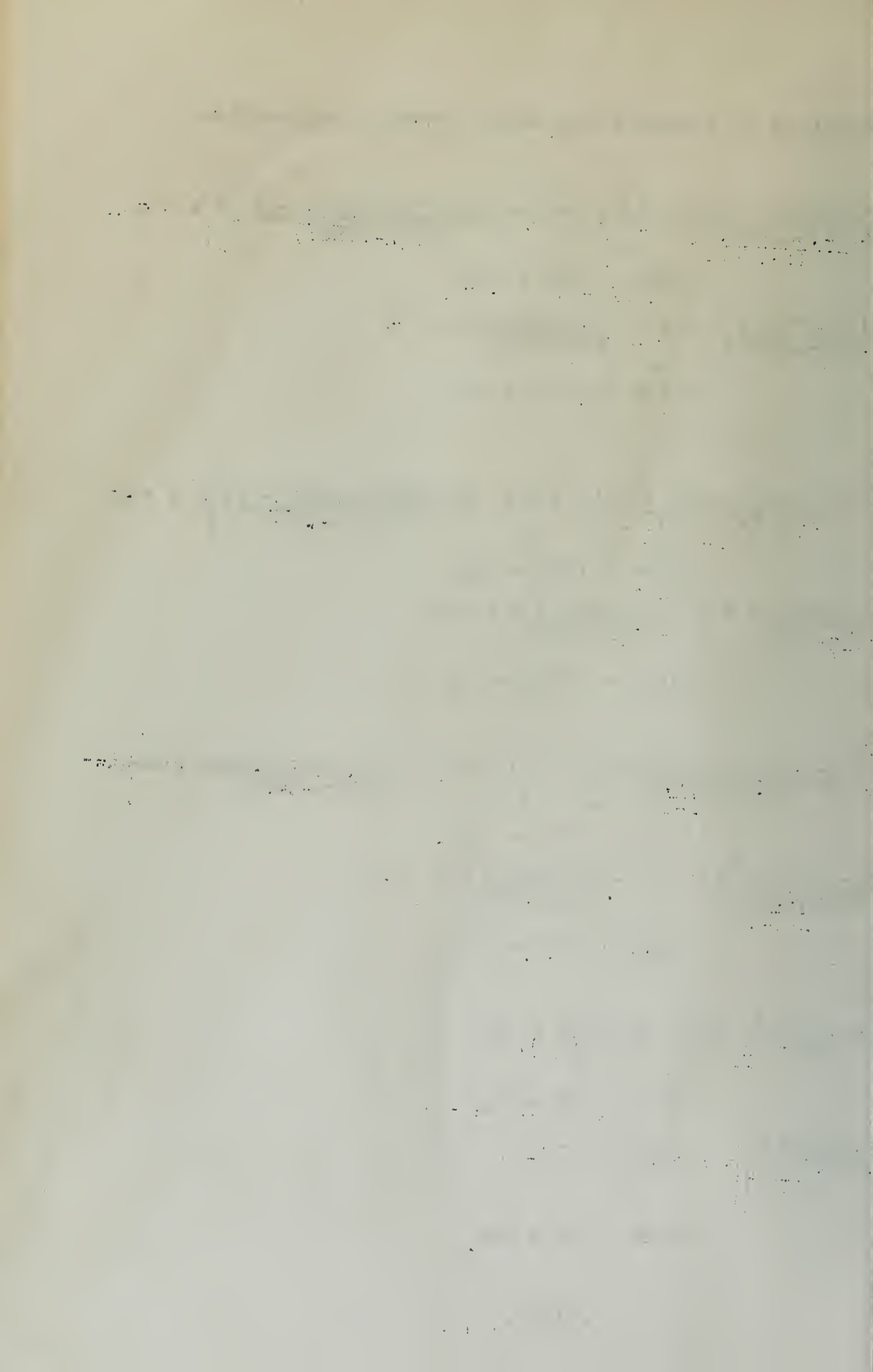
nel 4

$$4.5 + 2 + \left[\frac{3(-2)}{4} \right] A + \left[1 + \frac{3(-2)}{4} \right] B = -Q_A$$

$$5.0A - .5B = -Q_A$$

$$2 + 6 - \left[\frac{3(2)}{4} \right] B + \left[1 - \frac{3(2)}{4} \right] A = -Q_B$$

$$6.5B - .5A = -Q_B$$



Panel 5

$$\left[1.5 \times 4 + \frac{2}{4} \right] E - \frac{2}{4} F = -Q_E$$

$$6.5E - 0.5F = -Q_E$$

$$\left[1.5 \times 3 + \frac{2}{4} \right] F - \frac{2}{4} E = -Q_F$$

$$5.0F - 0.5E = -Q_F$$

Panel 6

$$\left[3 + 1.5 \times 3 - \frac{(3-2 \times .0482)3}{2(2-.0482)} \right] F + \left[\frac{3}{2} - \frac{(3-.0482)(3)}{2(2-.0482)} \right] G = -Q_F$$

$$5.26F - 0.77G = -Q_F$$

$$\left[2 + 3 + \frac{(3-.0482)(.0507 \times 2 - 3)}{2(2-.0482)} \right] G + \left[\frac{3}{2} + \frac{(3-2 \times .0482)(.0507 \times 2 - 3)}{2(2-.0482)} \right] F = -Q_G$$

$$3.81G - 0.65F = -Q_G$$

Panel 7

$$\left[4 + 1.5 \times 2 - \frac{(3-2 \times .0443)4}{2(2-.0443)} \right] G + \left[\frac{4}{2} - \frac{(3-.0443)4}{2(2-.0443)} \right] H = -Q_G$$

$$4.03G - 1.02H = -Q_G$$

$$\left[1 + 4 + \frac{(3-.0443)(.0463 \times 1 - 4)}{2(2-.0443)} \right] H + \left[\frac{4}{2} + \frac{(3-2 \times .0443)(.0463 \times 1 - 4)}{2(2-.0443)} \right] G = -Q_H$$

$$2.52H - 0.93G = -Q_H$$

Panel 8

$$\left[4 + 1.5 \times 1 - \frac{(3-2 \times .0866)4}{2(2-.0866)} \right] F + \left[\frac{4}{2} - \frac{(3-.0866)4}{2(2-.0866)} \right] I = -Q_H$$

$$2.54H - 1.040 = -Q_H$$

$$\left[.5 \times 1 + 4 + \frac{(3-.0866)(.0942 \times 1 - 4)}{2(2-.0866)} \right] I + \left[\frac{4}{2} - \frac{(3-2 \times .0866)(.0942 \times 1 - 4)}{2(2-.0866)} \right] H = -Q_I$$

$$2.52I - 0.90 = -Q_I$$

$$-\frac{1}{2} \left(\frac{1}{1-x} \right) = -\frac{1}{2} \sum_{n=0}^{\infty} x^n$$

$$12 \cdot 2 = 24$$

$$(12 \cdot 2) \cdot (12 \cdot 2)$$

Joint Constant Computation - Load at B

Panel 1

$$2.52A - .90B = 6.14$$

$$-1.04A + 2.54B = 6.28$$

$$A = 3.89 \quad B = 4.07$$

$$R_1 = \frac{2.91 \times 3.89 + 2.83 \times 4.07}{3.82} + 1.57 = 7.45$$

$$M_{AB} = 4(3.89 + \frac{4.07}{2} - 7.45) = -6.12$$

$$M_{BA} = 4(4.07 + \frac{3.89}{2} - 7.45) = -5.80$$

Panel 2

$$2.52B - .93C = -1.20$$

$$-1.02B + 4.03C = -1.21$$

$$B = -.65 \quad C = -.46$$

$$R_2 = \frac{-2.96 \times .65 - 2.91 \times .46}{3.92} - .30 = -1.13$$

$$M_{BC} = 4(-.65 - \frac{.46}{2} + 1.13) = 1.00$$

$$M_{CB} = 4(-.46 - \frac{.65}{2} + 1.13) = 1.40$$

Panel 3

$$3.81C - .65D = -1.16$$

$$-.77C + 5.25D = -1.19$$

$$C = -.35 \quad D = -.28$$

$$R_3 = \frac{-2.95 \times .35 - 2.90 \times .28}{3.90} - .40 = -.87$$

$$M_{CD} = 3(-.35 - \frac{.28}{2} + .87) = 1.14$$

$$M_{DC} = 3(-.28 - \frac{.35}{2} + .87) = 1.26$$

Panel 4

$$5.0D - .5E = -.94$$

$$-.5D + 6.5E = -.94$$

$$D = -.20 \quad E = -.16$$

$$R_4 = 3/4(-.20 - .16) + .47 = -.74$$

$$M_{DE} = 2(-.20 - \frac{.16}{2} + .74) = .92$$

$$M_{ED} = 2(-.16 - \frac{.20}{2} + .74) = .96$$

anel 5

$$6.5E - 0.5F = -0.94$$

$$-0.5E + 5.0F = -0.94$$

$$E = -0.16$$

$$F = -0.20$$

$$R_5 = \frac{3}{4}(-.20 - .16) - 0.47 = -.74$$

$$M_{EF} = 2(-.16 - \frac{.20}{2} + .74) = .96$$

$$M_{FE} = 2(-.20 - \frac{.16}{2} + .74) = .92$$

anel 6

$$5.26F - 0.77G = -0.82$$

$$-0.65F + 3.81G = -0.79$$

$$F = -0.19 \quad G = -0.24$$

$$R_6 = \frac{-2.90 \times .19 - 2.95 \times .24}{3.90} - 0.27 = -0.59$$

$$M_{FG} = 3(-.19 - \frac{.24}{2} + .59) = .84$$

$$M_{GF} = 3(-.24 - .19 + .59) = .75$$

anel 7

$$4.03G - 1.02H = -0.87$$

$$-0.93G + 2.52H = -0.86$$

$$G = -0.33 \quad H = -0.46$$

$$R_7 = \frac{-2.91 \times .33 - 2.96 \times .46}{3.91} - 0.22 = -0.82$$

$$M_{GH} = 4(-.33 - \frac{.44}{2} + .82) = 1.04$$

$$M_{HG} = 4(-.46 - \frac{.33}{2} + .82) = .80$$

anel 8

$$2.54H - 1.04I = -0.90$$

$$-0.90H + 2.52I = -0.88$$

$$H = -0.58 \quad I = -0.56$$

$$R_8 = \frac{-2.83 \times 0.58 - 2.91 \times 0.56}{3.83} - .22 = -1.08$$

$$M_{HI} = 4(-.58 - \frac{.56}{2} + 1.08) = .88$$

$$M_{IH} = 4(-.56 - \frac{.58}{2} + 1.08) = .92$$

Load at C

Panel 1

$$\begin{aligned} 2.52A - .90B &= 5.27 \\ -1.04A + 2.54B &= 5.38 \end{aligned}$$

$$A = 3.33 \quad B = 3.48$$

$$\begin{aligned} R_1 &= \frac{2.91 \times 3.33 + 2.83 \times 3.48}{3.82} + 1.35 = 6.47 \\ M_{AB} &= 4\left(3.33 + \frac{3.48}{2} - 6.47\right) = -5.88 \\ M_{BA} &= 4\left(3.48 + \frac{3.33}{2} - 6.47\right) = -5.32 \end{aligned}$$

Panel 2

$$\begin{aligned} 2.52B - .90C &= 5.17 \\ -1.02B + 4.03C &= 5.23 \end{aligned}$$

$$B = 2.79 \quad C = 2.0$$

$$\begin{aligned} R_2 &= \frac{2.96 \times 2.79 + 2.91 \times 2.0}{3.92} + 1.31 = 4.90 \\ M_{BC} &= 4\left(2.79 + \frac{2.0}{2} - 4.90\right) = -4.44 \\ M_{CB} &= 4\left(2.0 + \frac{2.79}{2} - 4.90\right) = -6.04 \end{aligned}$$

Panel 3

$$\begin{aligned} 3.81C - .65D &= -2.31 \\ -.77C + 5.26D &= -2.33 \end{aligned}$$

$$C = -.70 \quad D = -.56$$

$$\begin{aligned} R_3 &= \frac{-2.95 \times .70 - 2.90 \times .56}{3.90} - .79 = -1.74 \\ M_{CD} &= 3\left(-.70 - \frac{.56}{2} + 1.74\right) = 2.28 \\ M_{DC} &= 3\left(-.56 - \frac{.70}{2} + 1.74\right) = 2.49 \end{aligned}$$

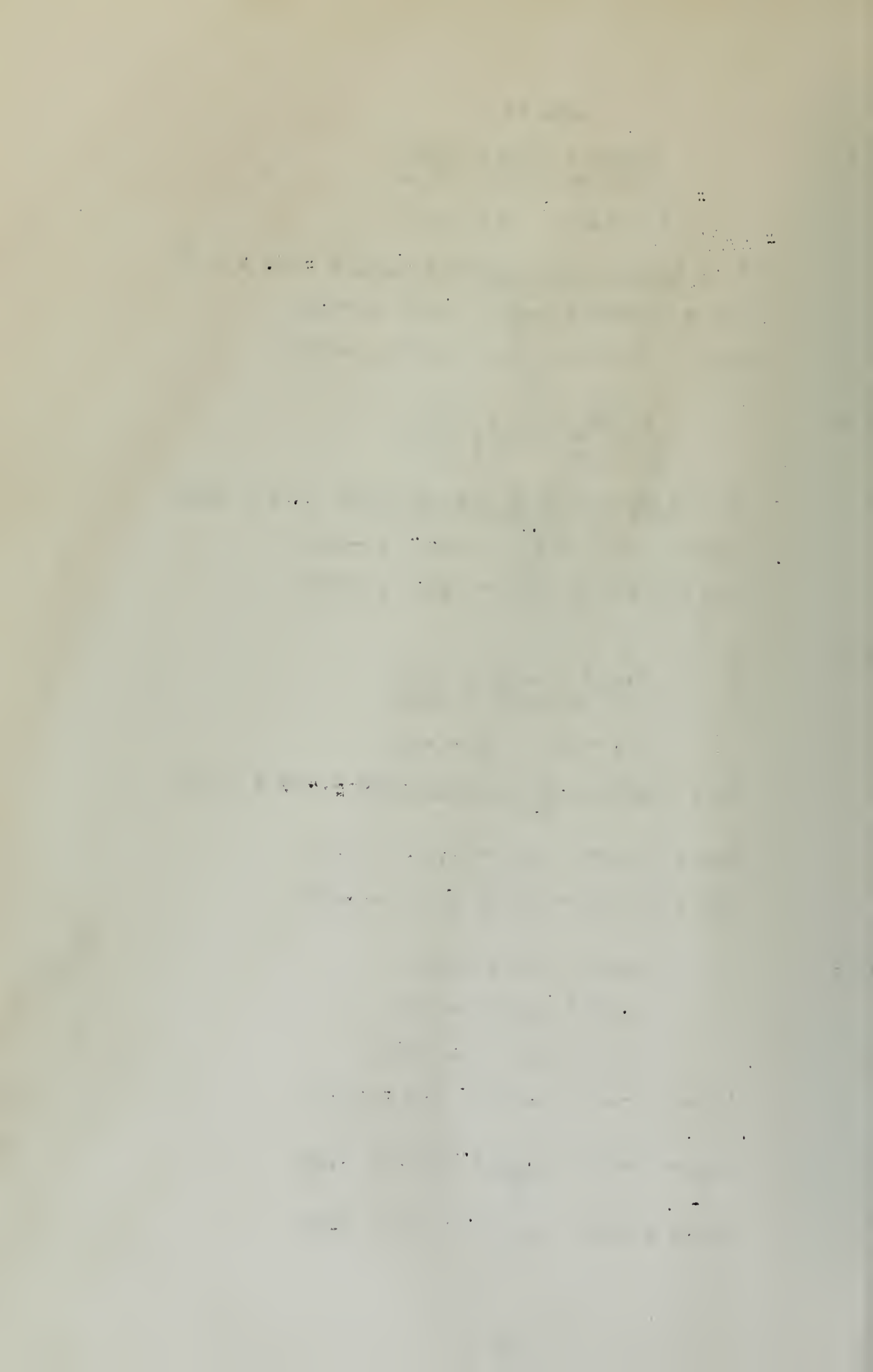
Panel 4

$$5.0D - .5E = -1.87$$

$$-.5D + 6.5E = -1.87$$

$$D = -.41 \quad E = -.32$$

$$\begin{aligned} R_4 &= \frac{3}{4} \left(-.41 - .32\right) - .94 = -1.50 \\ M_{DE} &= 2\left(-.41 - \frac{.32}{2} + 1.50\right) = 1.86 \\ M_{ED} &= 2\left(-.32 - \frac{.41}{2} + 1.50\right) = 1.96 \end{aligned}$$



Panel 5

$$E = -0.32$$

$$F = -0.40$$

$$R_5 = -1.48$$

$$M_{EF} = 1.92$$

$$M_{FE} = 1.84$$

Panel 6

$$F = -0.73$$

$$G = -0.15$$

$$R_6 = -1.18$$

$$M_{FG} = 1.68$$

$$M_{GF} = 1.50$$

Panel 7

$$G = -0.86$$

$$H = -0.85$$

$$R_7 = -1.64$$

$$M_{GH} = 2.05$$

$$M_{HG} = 1.60$$

Panel 8

$$H = -1.16$$

$$I = -1.11$$

$$R_8 = -2.23$$

$$M_{HI} = 1.75$$

$$M_{IH} = 1.84$$

Load at D

$$\begin{aligned} 2.52A - .90B &= 4.38 \\ -1.04A + 2.54B &= 4.49 \end{aligned}$$

$$A = 2.79 \quad B = 2.91$$

$$R_1 = \frac{2.91 \times 2.79 + 2.83 \times 2.91}{3.82} - 1.12 = 5.40$$

$$M_{AB} = 4\left(2.79 + \frac{2.91}{2} - 5.40\right) = -4.64$$

$$M_{BA} = 4\left(2.91 + \frac{2.79}{2} - 5.40\right) = -4.40$$

Panel 2

$$\begin{aligned} 2.52B - .93C &= 4.31 \\ -1.02B + 4.03C &= 4.36 \end{aligned}$$

$$B = 2.33 \quad C = 1.66$$

$$R_2 = \frac{2.96 \times 2.33 + 2.91 \times 1.66}{3.92} - 1.09 = 4.09$$

$$M_{BC} = 4\left(2.33 + \frac{1.66}{2} - 4.09\right) = -3.72$$

$$M_{CB} = 4\left(1.66 + \frac{2.33}{2} - 4.09\right) = -5.08$$

Panel 3

$$\begin{aligned} 3.81C - .65D &= 3.98 \\ -.77C + 5.26D &= 4.12 \end{aligned}$$

$$C = 1.21 \quad D = .96$$

$$R_3 = \frac{2.95 \times 1.21 + 2.90 \times .96}{3.90} - 1.37 = 2.99$$

$$M_{CD} = 3\left(1.21 + \frac{.96}{2} - 2.99\right) = -3.90$$

$$M_{DC} = 3\left(.96 + \frac{1.21}{2} - 2.99\right) = -4.29$$

Panel 4

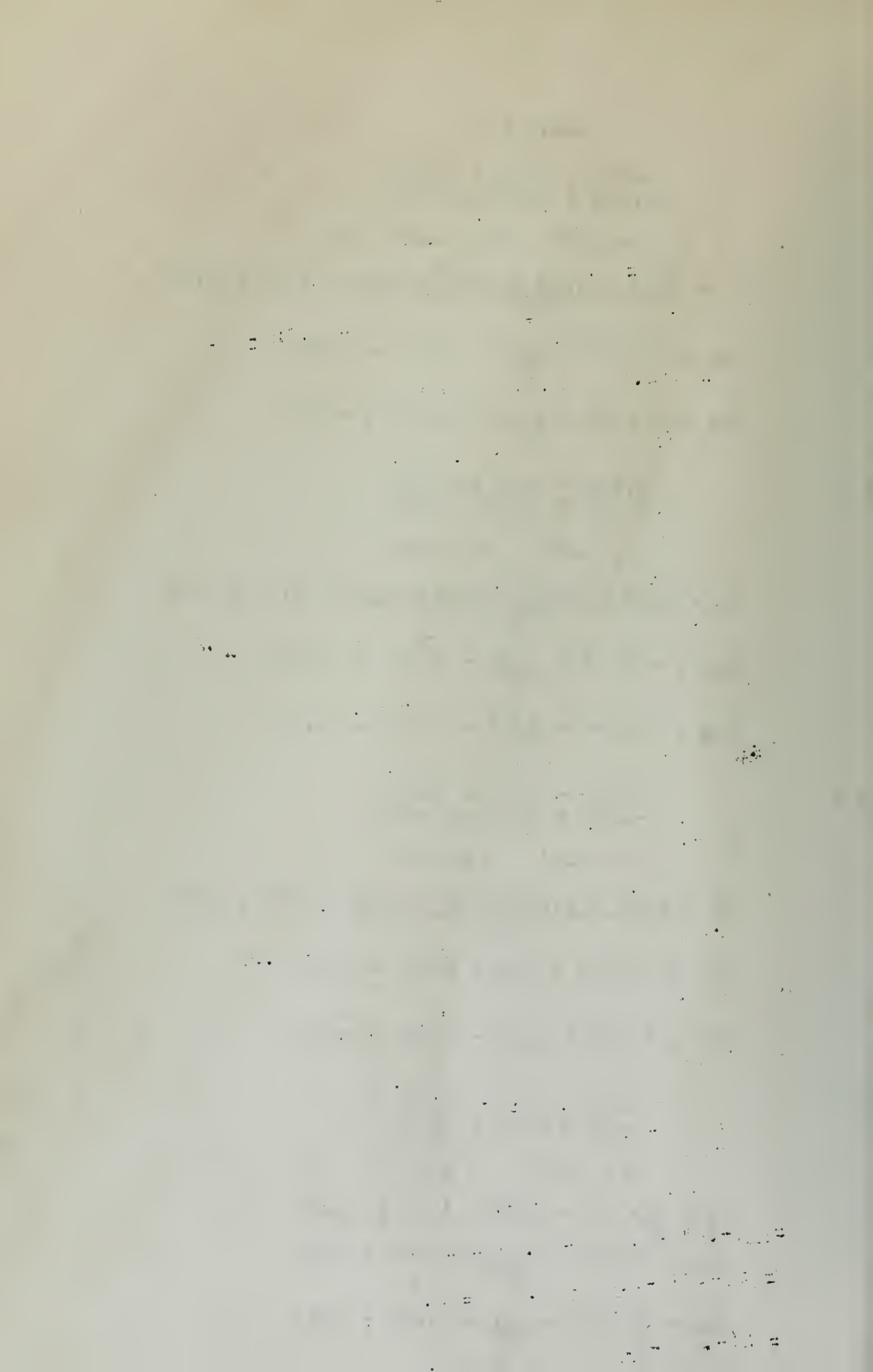
$$\begin{aligned} 5.0D - .5E &= -2.82 \\ -.5D + 6.5E &= -2.82 \end{aligned}$$

$$D = -.61 \quad E = -.48$$

$$R_4 = \frac{3(-.61 - .49)}{4} - 1.41 = -2.23$$

$$M_{DE} = 2\left(-.61 - \frac{.48}{2} + 2.23\right) = 2.76$$

$$M_{ED} = 2\left(-.48 - \frac{.61}{2} + 2.23\right) = 2.90$$



Panel 5

$$E = -0.48$$

$$F = -1.60$$

$$R_5 = -2.22$$

$$M_{EF} = 2.88$$

$$M_{FE} = 2.76$$

Panel 6

$$F = -0.57$$

$$G = -1.72$$

$$R_6 = -1.77$$

$$M_{FG} = 2.52$$

$$M_{GF} = 2.25$$

Panel 7

$$G = -0.99$$

$$H = -1.39$$

$$R_7 = -2.46$$

$$M_{GH} = 3.12$$

$$M_{HG} = 2.40$$

Panel 8

$$H = -1.74$$

$$I = -1.68$$

$$R_8 = -3.24$$

$$M_{HI} = 2.64$$

$$M_{IH} = 2.76$$

1. 1. 1.

2. 2. 2.

3. 3. 3.

4. 4. 4.

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Load at E

Panel 1

$$2.52A - .91B = 3.51$$

$$-1.04A + 2.54B = 3.59$$

$$A = 2.22 \quad B = 2.33$$

$$R_1 = \frac{2.91 \times 2.22 + 2.83 \times 2.33}{3.82} + .90 = 4.32$$

$$M_{AB} = 4\left(2.22 + \frac{2.33}{2} - 4.32\right) = -3.76$$

$$M_{BA} = 4\left(2.33 + \frac{2.22}{2} - 4.32\right) = -3.52$$

Panel 2

$$2.52B - .93C = 3.44$$

$$-1.02B + 4.03C = 3.49$$

$$B = 1.86 \quad C = 1.33$$

$$R_2 = \frac{2.96 \times 1.86 + 2.91 \times 1.33}{3.92} + .87 = 3.26$$

$$M_{BC} = 4\left(1.86 + \frac{1.33}{2} - 3.26\right) = -2.96$$

$$M_{CB} = 4\left(2.33 + \frac{1.86}{2} - 3.26\right) = -4.00$$

Panel 3

$$3.81C - .65D = 3.18$$

$$-.77C + 5.26D = 3.30$$

$$C = .97 \quad D = .77$$

$$R_3 = \frac{2.95 \times .97 + 2.90 \times .77}{3.90} + 1.10 = 2.40$$

$$M_{CD} = 3\left(.97 + .77/2 - 2.40\right) = -3.15$$

$$M_{DC} = 3\left(.77 + .97/2 - 2.40\right) = -3.84$$

Panel 4

$$5.0D - .5E = 3.75$$

$$-.5D + 6.5E = 3.75$$

$$D = .82 \quad E = .64$$

$$R_4 = 3/4\left(.82 + .64\right) + 1.88 = 2.97$$

$$M_{DE} = 2\left(.82 + .64/2 - 2.97\right) = -3.66$$

$$M_{ED} = 2\left(.64 + .82/2 - 2.97\right) = -3.84$$

Panel 5

$$E = -0.64$$

$$F = -0.80$$

$$R_5 = -2.96$$

$$M_{EF} = 3.84$$

$$M_{FE} = 3.68$$

Panel 6

$$F = -0.76$$

$$G = -0.96$$

$$R_6 = -2.36$$

$$M_{FG} = 3.36$$

$$M_{GF} = 3.00$$

Panel 7

$$G = -1.32$$

$$H = -1.84$$

$$R_7 = -3.28$$

$$M_{GH} = 4.16$$

$$M_{HG} = 3.20$$

Panel 8

$$H = -2.32$$

$$I = -2.24$$

$$R_8 = -4.32$$

$$M_{HI} = 3.52$$

$$M_{IH} = 3.68$$

First Moment Corrections - Load at B

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -1.00$$

$$A = -.16 \quad B = -.46$$

$$R_1 = \frac{-2.91 \times .16 - 2.83 \times .46}{3.83} = -0.46$$

$$M_{AB} = 4(-.16 - .46/2 + .46) = .28$$

$$M_{BA} = 4(-.46 - .16/2 + .46) = -.32$$

Panel 2

$$2.52B - .93C = 5.80$$

$$-1.02B + 4.03C = -1.14$$

$$B = 2.42 \quad C = .33$$

$$R_2 = \frac{2.90 \times 2.42 + 2.91 \times .33}{3.81} = 2.07$$

$$M_{BC} = 4(2.42 + .33/2 - 2.07) = 2.04$$

$$M_{CB} = 4(.33 + 2.42/2 - 2.07) = -2.16$$

Panel 3

$$3.81C - .65D = -1.40$$

$$-.77C + 5.26D = -.92$$

$$C = -.40 \quad D = -.23$$

$$R_3 = \frac{-2.95 \times .40 - 2.90 \times .23}{3.80} = -.47$$

$$M_{CD} = 3(-.40 - .23/2 + .47) = -.12$$

$$M_{DC} = 3(-.23 - .40/2 + .47) = .12$$

Panel 4

$$6.5D - 0.5E = -1.26$$

$$-0.5D + 5.0E = -.96$$

$$D = -.22 \quad E = -.21$$

$$R_4 = 3/4(-.22 - .21) = -.32$$

$$M_{DE} = 2(-.22 - .21/2 + .32) = 0$$

$$M_{ED} = 2(-.21 - .22/2 + .32) = 0$$

Panel 5

$$5.0E - 0.5F = -.96$$

$$-0.5 + 6.5F = -.84$$

$$E = -.21, F = -.14$$

$$R_5 = \frac{3}{2} (-.21 - .14) = -.26$$

$$M_{EF} = 2(-.21 - \frac{.14}{2} + .26) = -.04$$

$$M_{FE} = 2(-.14 - \frac{.21}{2} + .26) = .04$$

Panel 6

$$5.26F + 0.77G = -.92$$

$$-0.65F + 3.81G = -1.04$$

$$F = -.22, G = -.31$$

$$R_6 = \frac{-2.90 \times .22 - 2.95 \times .31}{3.90} = .40$$

$$M_{FG} = 3(-.22 - \frac{.31}{2} + .40) = .06$$

$$M_{GF} = 3(-.31 - \frac{.22}{2} + .40) = -.06$$

Panel 7

$$4.03G + 1.02H = -.75$$

$$-0.93G + 2.52H = -.88$$

$$G = -.30, H = -.46$$

$$R_7 = \frac{-2.91 \times .30 - 2.96 \times .46}{3.91} = -.57$$

$$M_{GH} = 4(-.30 - \frac{.46}{2} + .57) = .16$$

$$M_{HG} = 4(-.46 - \frac{.30}{2} + .57) = -.16$$

Panel 8

$$2.54H + 1.04I = -.60$$

$$-0.94H + 2.52I = 0$$

$$H = -.37, I = -.13$$

$$R_8 = \frac{-2.33 \times .37 - 2.91 \times .13}{3.83} = -.37$$

$$M_{HI} = 4(-.37 - \frac{.13}{2} + .37) = -.24$$

$$M_{IH} = 4(-.13 - \frac{.37}{2} + .37) = .24$$

Second Moment Corrections-Load at B

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -2.04$$

$$A = -.34, B = -.94$$

$$R_1 = \frac{-2.91 \times .34 - 2.83 \times .94}{3.83} = -.95$$

$$M_{AB} = 4(-.34 - \frac{.94}{2} + .95) = .56$$

$$M_{BA} = 4(-.94 - \frac{.34}{2} + .95) = -.64$$

Panel 3

$$3.81C - .65D = -2.18$$

$$-.77C + 5.26D = 0$$

$$C = -.58, D = -.08$$

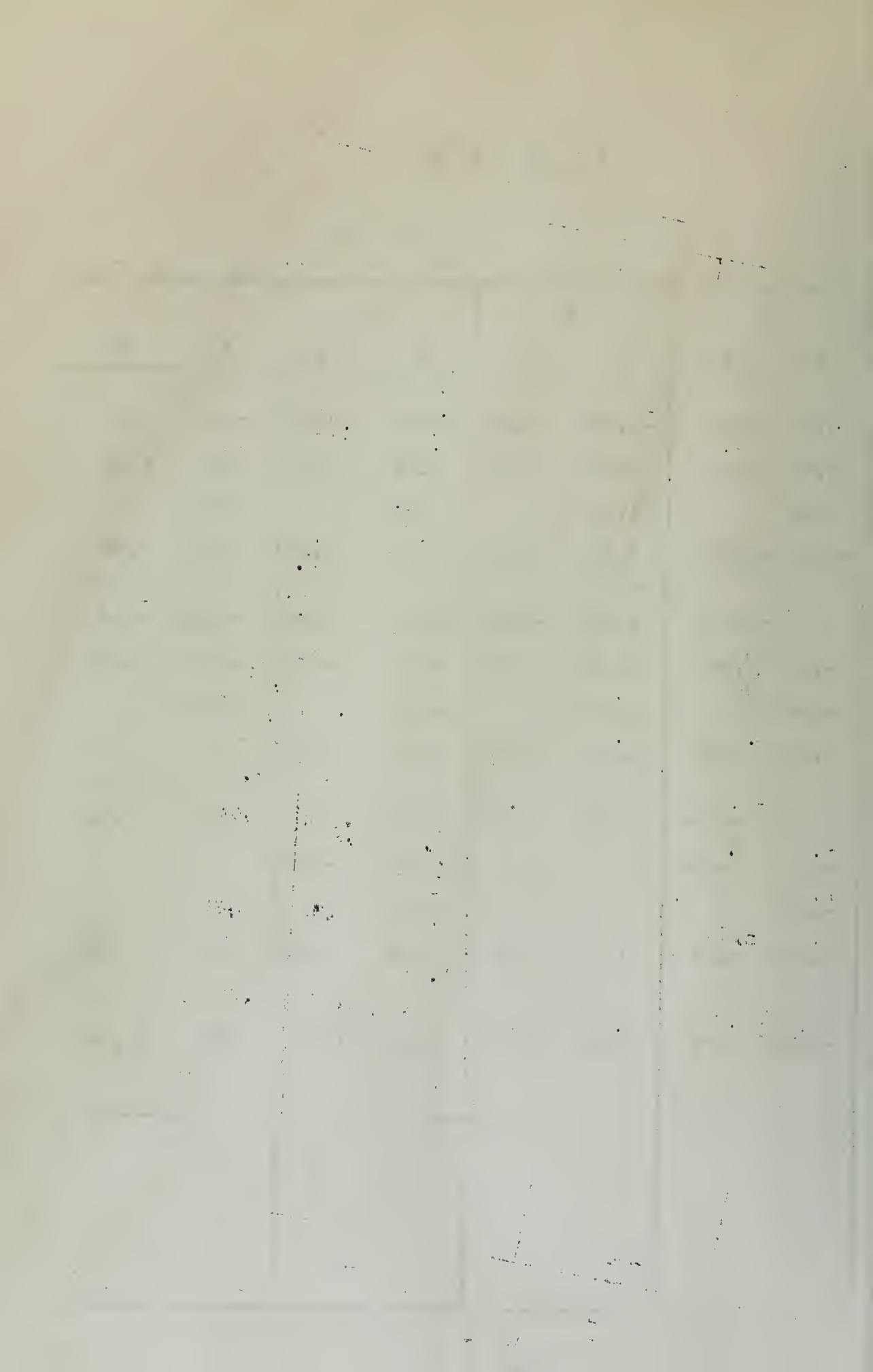
$$R_3 = \frac{-2.95 \times .58 - 2.90 \times .08}{3.90} = -.50$$

$$M_{CD} = 3(-.58 - \frac{.08}{2} + .50) = -.36$$

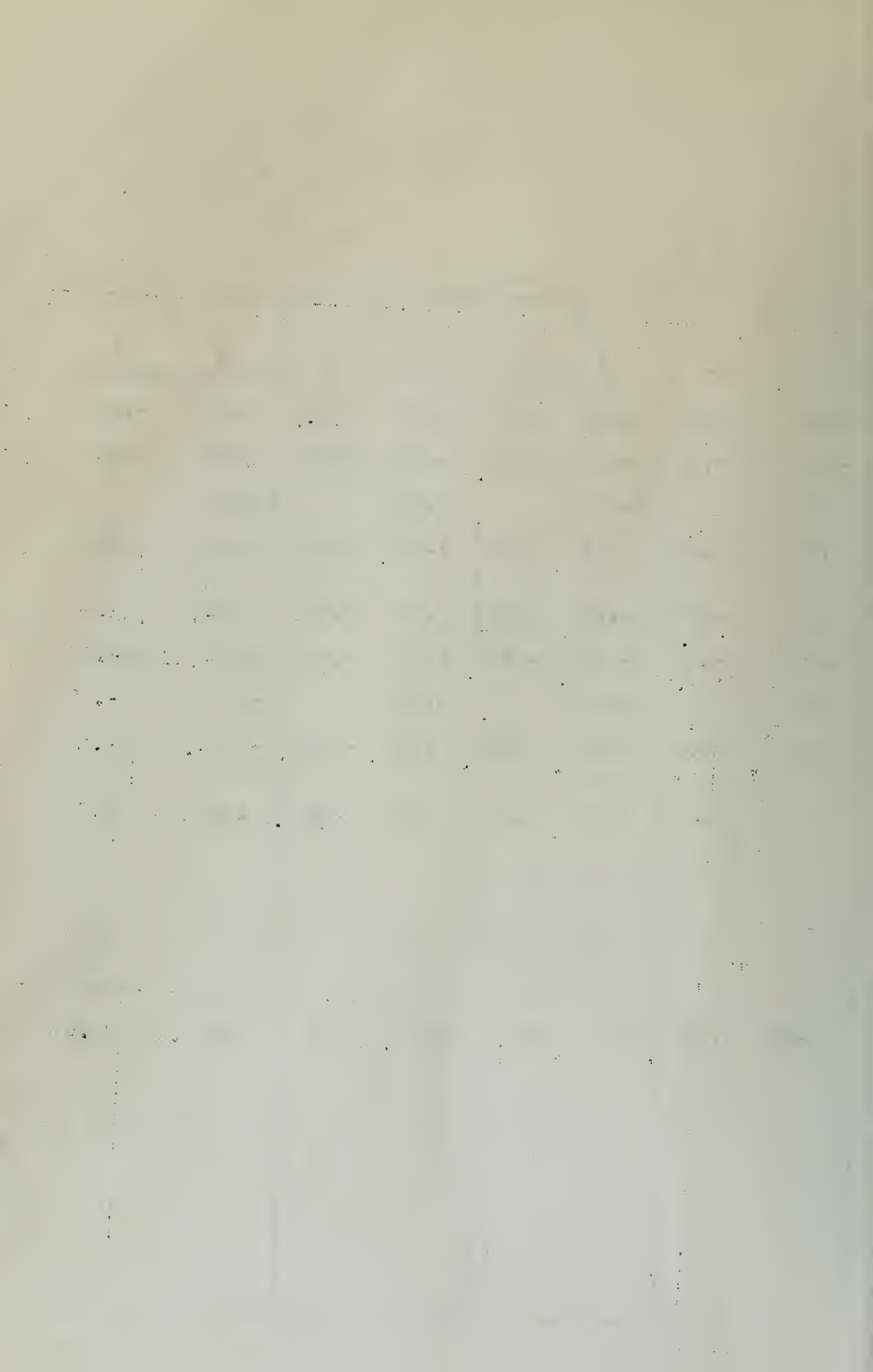
$$M_{DC} = 3(-.08 - \frac{.58}{2} + .50) = .39$$

Load at B

| anel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|------|
| oint | A | B | B | C | C | D | D | E |
| Q | 6.14 | 6.28 | -1.20 | -1.21 | -1.16 | -1.19 | -.94 | -.94 |
| C | 3.89 | 4.07 | -.65 | -.46 | -.35 | -.28 | -.20 | -.16 |
| R | 7.45 | | -1.13 | | -.87 | | -.74 | |
| E' | -6.12 | -5.80 | 1.00 | 1.40 | 1.14 | 1.26 | .92 | .96 |
| Q | 0 | -1.00 | 5.80 | -1.14 | -1.40 | -.92 | -1.26 | -.98 |
| C | -.16 | -.46 | 2.42 | .32 | -.40 | -.23 | -.22 | -.21 |
| R | -.46 | | 2.07 | | -.47 | | -.32 | |
| E'' | .28 | -.32 | 2.04 | -2.16 | -.12 | .12 | 0 | 0 |
| Q | 0 | -2.04 | .32 | .12 | -2.16 | 0 | -.12 | .04 |
| C | -.34 | -.94 | | | -.58 | -.08 | | |
| R | -.95 | | | | -.50 | | | |
| E''' | .56 | -.64 | 0 | 0 | -.36 | .39 | .0 | .00 |
| E'''' | -5.28 | -6.76 | 3.04 | -0.76 | .66 | 1.77 | .92 | .96 |



| Panel
Point | 5 | | 6 | | 7 | | 8 | |
|----------------|------|------|------|-------|------|------|-------|------|
| | E | F | F | G | G | H | H | I |
| Q | -.94 | -.94 | -.82 | -.79 | -.87 | -.86 | -.90 | -.88 |
| X | -.16 | -.20 | -.19 | -.24 | -.33 | -.46 | -.58 | -.56 |
| R | -.74 | | -.59 | | -.82 | | -1.08 | |
| H' | .96 | .92 | .34 | .75 | 1.04 | .80 | .88 | .92 |
| Q | -.96 | -.84 | -.92 | -1.04 | -.75 | -.88 | -.80 | 0 |
| C | -.21 | -.14 | -.22 | -.31 | -.50 | -.46 | -.37 | -.13 |
| R | -.26 | | -.40 | | -.57 | | -.37 | |
| H'' | -.04 | -.04 | .06 | -.06 | .16 | -.16 | -.24 | .24 |
| Q | 0 | -.06 | -.04 | .16 | .06 | .24 | .16 | 0 |
| C | | | | | | | | |
| R | | | | | | | | |
| H''' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| H | .92 | .96 | .90 | .69 | 1.20 | .64 | .64 | 1.16 |
| | | | | | | | | |
| | | | | | | | | |



First Moment Corrections - Load at C

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = 4.44$$

$$A = .73 \quad B = 2.05$$

$$R_1 = \frac{2.91 \times .73 + 2.83 \times 2.05}{3.83} = 2.06$$

$$M_{AB} = 4(.73 + 2.05/2 - 2.06) = -1.24$$

$$M_{BA} = 4(2.05 + .73/2 - 2.06) = 1.40$$

Panel 2

$$2.52B - .93C = 5.32$$

$$-1.02B + 4.03C = -2.28$$

$$B = 2.10 \quad C = -.04$$

$$R_2 = \frac{2.93 \times 2.10 + 2.91 \times .04}{3.91} = 1.60$$

$$M_{BC} = 4(2.10 + .04/2 - 1.60) = 1.92$$

$$M_{CB} = 4(-.04 + 2.10/2 - 1.60) = -2.04$$

Panel 3

$$3.81C - 0.65D = 6.04$$

$$-0.77C + 5.26D = -1.86$$

$$C = 1.56 \quad D = -.12$$

$$R_3 = \frac{2.95 \times 1.56 + 2.90 \times .12}{3.90} = 1.09$$

$$M_{CD} = 3(1.56 + .12/2 - 1.09) = 1.23$$

$$M_{DC} = 3(-.12 + 1.56/2 - 1.09) = -1.29$$

Panel 4

$$6.5D - 0.5E = -2.49$$

$$-0.5D + 5.0E = -1.92$$

$$D = -.42 \quad E = -.42$$

$$R_4 = 3/4(-.42 - .42) = -.63$$

$$M_{DE} = 2(-.42 - .42/2 + .63) = 0$$

$$M_{ED} = 2(-.42 - .42/2 + .63) = 0$$

Panel 5 $5.0E - 0.5F = -1.96$

$$-0.5E + 6.5F = -1.63$$

$$E = -.42 \quad F = -.29$$

$$R_5 = 3/4(-.42 - .29) = -.53$$

$$M_{EF} = 2(-.42 - .29/2 + .53) = -.06$$

$$M_{FE} = 2(-.29 - .42/2 + .53) = .06$$

Panel 6 $5.26F - 0.77G = -1.84$

$$-0.65F + 3.81G = -2.08$$

$$F = -.44 \quad G = -.62$$

$$R_6 = \frac{-2.90 \times .44 - 2.95 \times .62}{3.96} = -.80$$

$$M_{FG} = 3(-.44 - .62/2 + .80) = .15$$

$$M_{GF} = 3(-.29 - .44/2 + .80) = -.12$$

Panel 7 $4.03G - 1.02H = -1.50$

$$-0.93G + 2.52H = -1.76$$

$$G = -.60 \quad H = -.92$$

$$R_7 = \frac{-2.91 \times .60 - 2.96 \times .92}{3.91} = -1.14$$

$$M_{GH} = 4(-.60 - .92/2 + 1.14) = .32$$

$$M_{HG} = 4(-.92 - .60/2 + 1.14) = -.32$$

Panel 8 $2.54H - 1.04I = -1.60$

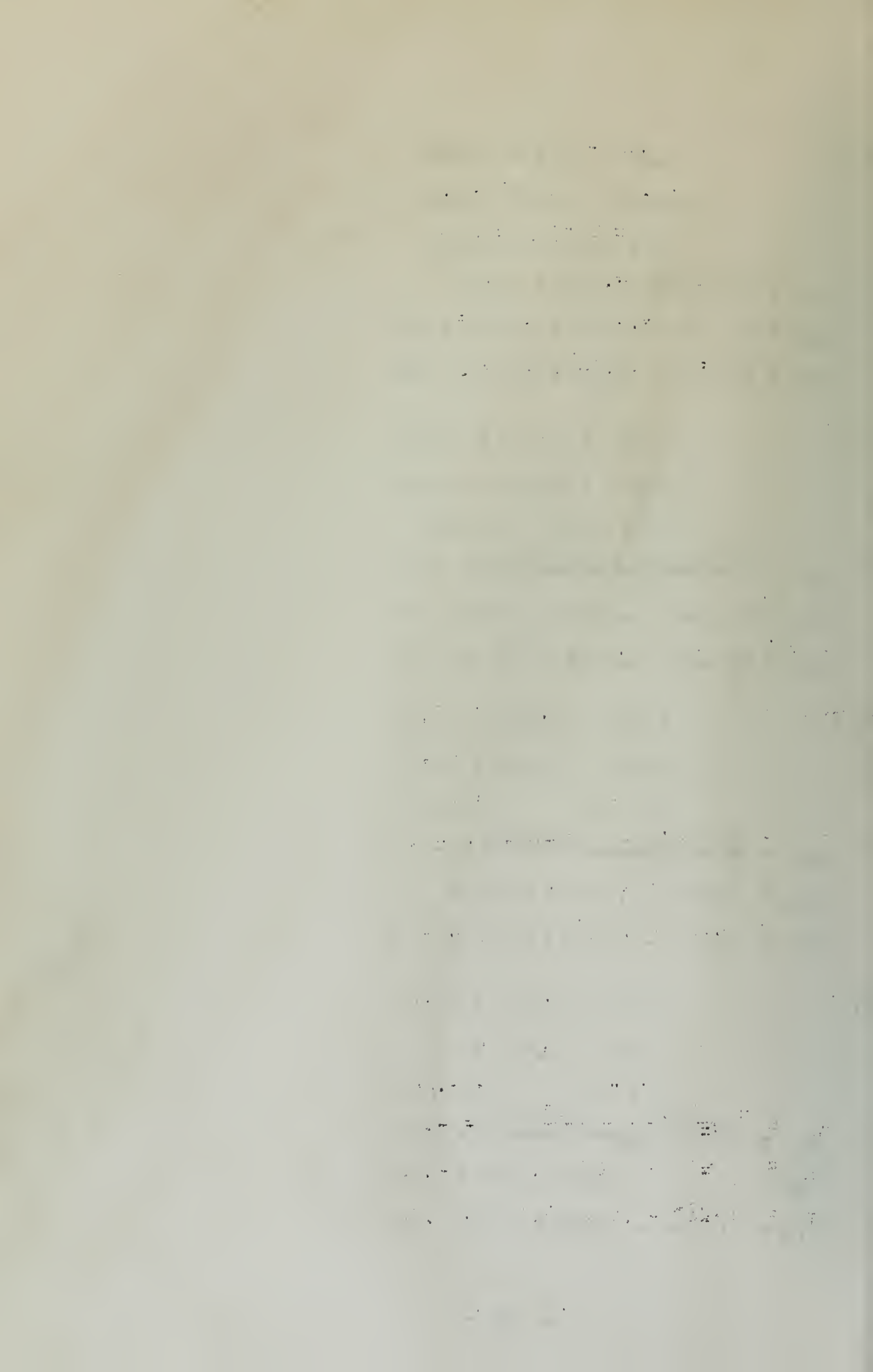
$$-0.90H + 2.52I = 0$$

$$H = -.74 \quad I = -.26$$

$$R_8 = \frac{-2.83 \times .74 - 2.91 \times .26}{3.83} = -.74$$

$$M_{HI} = 4(-.74 - .26/2 + .74) = -.52$$

$$M_{IH} = 4(-.26 - .74/2 + .74) = .44$$



Second Moment Corrections - Load at C

Panel 1

$$2.52A - 0.90B = 0$$

$$-1.04A + 2.54B = -1.92$$

$$A = -.32 \quad B = -.88$$

$$R_1 = \frac{-2.91 \times .32 - 2.83 \times .88}{3.83} = -.89$$

$$M_{AB} = 4(-.32 - .88/2 + .89) = .52$$

$$M_{BA} = 4(-.88 - .32/2 + .89) = -.60$$

Panel 2

$$2.52B - 0.93C = -1.40$$

$$-1.02B + 4.03C = -1.23$$

$$B = -.74 \quad C = -.49$$

$$R_2 = \frac{-2.96 \times .74 - 2.91 \times .49}{3.91} = -.93$$

$$M_{BC} = 4(-.74 - .49/2 + .93) = -.24$$

$$M_{CB} = 4(-.49 - .74/2 + .93) = .28$$

Panel 3

$$3.81C - 0.65D = 2.04$$

$$-0.77C + 5.28D = 0$$

$$C = .55 \quad D = .08$$

$$R_3 = \frac{2.95 \times .55 + 2.90 \times .08}{3.90} = .47$$

$$M_{CD} = 3(.55 + .08/2 - .47) = .36$$

$$M_{DC} = 3(.08 + .55/2 - .47) = -.36$$

Panel 4

$$6.5D - 0.5E = 1.29$$

$$-0.5D + 5.0E = .06$$

$$D = .20 \quad E = .03$$

$$R_4 = 2/4(.20 + .03) = .17$$

$$M_{DE} = 2(.20 + .03/2 - .17) = .08$$

$$M_{ED} = 2(.03 + .20/2 - .17) = -.08$$

nel 5

$$5.0E - 0.5F = 0$$

$$-0.5E + 6.5F = -.15$$

$$E = 0 \quad F = -.02$$

$$R_5 = 3/4(-.02) = -.02$$

$$M_{EF} = 0$$

$$M_{FE} = 0$$

nel 6

$$5.26F - 0.77G = -.06$$

$$-0.65F + 3.81G = -.32$$

$$F = -.02 \quad G = -.08$$

$$R_6 = \frac{-2.90x.02 - 2.95x.08}{3.90} = -.07$$

$$M_{FG} = 3(-.02 - .08/2 + .07) = .03$$

$$M_{GF} = 3(-.08 - .02/2 + .07) = -.06$$

nel 7

$$4.03G - 1.02H = .12$$

$$-0.93G + 2.52H = .52$$

$$G = .09 \quad H = .24$$

$$R_7 = \frac{2.91x.09 + 2.96x.24}{3.91} = .25$$

$$M_{GH} = 4(.09 + .24/2 - .25) = -.16$$

$$M_{HG} = 4(.24 + .09/2 - .25) = .16$$

nel 8

$$2.54H - 1.04I = .32$$

$$-0.90H - 2.52I = 0$$

$$H = .15 \quad I = .05$$

$$R_8 = \frac{2.83x.15 + 2.91x.05}{3.83} = .15$$

$$M_{HI} = 4(.15 + .05/2 - .15) = .10$$

$$M_{IH} = 4(.05 + .15/2 - .15) = -.10$$

Load at C

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| Q | 5.27 | 5.33 | 5.17 | 5.23 | -2.31 | -2.38 | -1.87 | -1.87 |
| α | 3.33 | 3.48 | 2.79 | 2.00 | - .70 | - .56 | - .41 | - .32 |
| R | 6.47 | | 4.90 | | -1.74 | | -1.50 | |
| M | -5.88 | -5.32 | -4.44 | -6.04 | 2.28 | 2.49 | 1.86 | 1.96 |
| Q | 0 | 4.44 | 5.32 | -2.28 | 6.04 | -1.86 | -2.49 | -1.92 |
| α | .73 | 2.05 | 2.10 | - .04 | 1.56 | - .12 | - .42 | - .42 |
| R | 2.06 | | 1.60 | | 1.09 | | - .63 | |
| M' | -1.24 | 1.40 | 1.92 | -2.04 | 1.23 | -1.29 | 0 | 0 |
| Q | 0 | -1.92 | -1.40 | -1.23 | 2.04 | 0 | 1.29 | .06 |
| | - .32 | - .88 | - .74 | - .49 | .55 | .08 | .20 | .03 |
| R | - .89 | | - .93 | | .47 | | .17 | |
| M'' | .52 | - .60 | - .24 | .28 | .36 | - .36 | .08 | - .08 |
| H | -6.60 | -4.52 | -3.76 | -7.80 | 3.87 | .84 | 1.94 | 1.88 |

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the transparency and accountability of the organization. This section also outlines the various methods used to collect and analyze data, ensuring that the information is reliable and up-to-date.

2. The second part of the document focuses on the implementation of these practices across different departments. It provides a detailed overview of the current state of affairs, highlighting areas where improvements are needed. The text also includes a list of specific actions that must be taken to address these issues, along with a timeline for their completion.

3. The third part of the document discusses the role of leadership in ensuring the success of these initiatives. It stresses that leaders must provide clear guidance and support to their teams, as well as monitor progress and make adjustments as needed. This section also includes a discussion of the importance of communication and collaboration between different departments.

4. The fourth part of the document provides a summary of the key findings and recommendations. It reiterates the importance of maintaining accurate records and implementing best practices across all departments. The text also includes a final statement of intent, expressing the organization's commitment to transparency and accountability.

| 5 | | 6 | | 7 | | 8 | |
|------|-------|-------|-------|-------|-------|-------|-------|
| E | F | F | G | G | H | H | I |
| 1.88 | -1.88 | -1.64 | -1.58 | -1.74 | -1.72 | -1.80 | -1.76 |
| .32 | - .40 | - .38 | - .48 | - .66 | - .93 | -1.16 | -1.12 |
| 1.48 | | -1.16 | | -1.64 | | -2.16 | |
| 1.92 | 1.84 | 1.68 | 1.50 | 2.08 | 1.60 | 1.76 | 1.84 |
| 1.96 | -1.68 | -1.84 | -2.08 | -1.50 | -1.76 | -1.60 | 0 |
| .42 | - .29 | - .44 | - .62 | - .60 | - .92 | - .74 | - .26 |
| .53 | | - .80 | | -1.14 | | - .74 | |
| .06 | .06 | .15 | - .12 | .32 | - .32 | - .52 | .44 |
| 0 | - .15 | - .06 | - .32 | .12 | .52 | .32 | 0 |
| 0 | - .02 | - .02 | - .08 | .09 | .24 | .15 | .05 |
| .02 | | - .07 | | .25 | | .15 | |
| 0 | 0 | .03 | - .06 | - .16 | .16 | .10 | - .10 |
| 1.86 | 1.90 | 1.86 | 1.32 | 2.24 | 1.44 | 1.34 | 2.28 |

1. The first part of the paper discusses the importance of maintaining accurate records of all transactions. This is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

2. The second part of the paper discusses the importance of maintaining accurate records of all transactions. This is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

3. The third part of the paper discusses the importance of maintaining accurate records of all transactions. This is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

4. The fourth part of the paper discusses the importance of maintaining accurate records of all transactions. This is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

5. The fifth part of the paper discusses the importance of maintaining accurate records of all transactions. This is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

Panel 5

$$-.5F + 6.5E = -2.90$$

$$5.0F - .5E = -2.52$$

$$E = -.49, F = -.55, R_5 = -1.70$$

$$I_{FE} = 2(-.49 - .55/2 + 1.70) = .04$$

$$I_{EF} = 2(-.55 - .49/2 + 1.70) = -1.02$$

Panel 6

$$-.77G + 5.26F = -2.76$$

$$3.01G - .65F = -3.12$$

$$F = -.66, G = -.93, R_6 = -1.20$$

$$I_{FG} = 3(-.66 - .93/2 + 1.20) = .21$$

$$I_{GF} = 3(-.93 - .66/2 + 1.20) = -1.18$$

Panel 7

$$-1.02H + 4.03G = -2.25$$

$$2.52H - .93G = -2.64$$

$$G = -.91, H = -1.30, R_7 = -1.71$$

$$I_{GH} = 4(-.91 - 1.30/2 + 1.71) = .44$$

$$I_{HG} = 4(-1.30 - .91/2 + 1.71) = -.48$$

Panel 8

$$-1.04I + 2.54H = -2.40$$

$$2.52I - .90H = 0$$

$$H = -1.11, I = -.39, R_8 = -1.12$$

$$I_{HI} = 4(-1.11 - .39/2 + 1.12) = -.72$$

$$I_{IH} = 4(-.39 - 1.11/2 + 1.12) = .72$$

Influence Line Corrections - Second Set - Load at D

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -.80$$

$$A = -.13, B = -.37, R_1 = -.37$$

$$M_{AB} = 4(-.13 - .37/2 + .37) = .24$$

$$M_{BA} = 4(-.37 - .13/2 + .37) = -.24$$

Panel 2

$$2.52B - .93C = -1.08$$

$$-1.02B + 4.03C = -1.17$$

$$B = -.59, C = -.44, R_2 = -.77$$

$$M_{BC} = 4(-.59 - .44/2 + .77) = -.16$$

$$M_{CB} = 4(-.44 - .59/2 + .77) = .16$$

Panel 3

$$3.81C - .65D = .76$$

$$-.77C + 5.26D = +1.60$$

$$C = .18, D = -.09, R_3 = .08$$

$$M_{CD} = 3(.18 - .09/2 - .08) = .18$$

$$M_{DC} = 3(-.09 + .18/2 - .08) = -.24$$

Panel 4

$$5.0D - .5E = 1.26$$

$$-.5D + 6.5E = -.54$$

$$D = .25, E = .01, R_4 = .20$$

$$M_{DE} = 2(.25 + .01/2 - .20) = .10$$

$$M_{ED} = 2(.01 + .25/2 - .20) = -.14$$

Panel 5

$$-.5F + 6.5E = .60$$

$$5.0F - .5E = -.21$$

$$E = .09, F = -.03, R_5 = .04$$

$$M_{EF} = 2(.09 - .03/2 - .04) = .08$$

$$M_{FE} = 2(-.03 + .09/2 - .04) = -.06$$

Panel 6

$$-.77G + 5.26F = .02$$

$$3.81G - .65F = -.44$$

$$F = -.01, G = -.12, R_6 = -.10$$

$$M_{FG} = 3(-.01 - .12/2 + .10) = .09$$

$$M_{GF} = 3(-.12 - .01/2 + .10) = -.09$$

Panel 7

$$-1.02H + 4.03G = .18$$

$$2.52H - .93G = .72$$

$$G = .13, H = .33, R_7 = .35$$

$$M_{GH} = 4(.13 + .33/2 - .35) = -.24$$

$$M_{HG} = 4(.33 + .13/2 - .35) = .20$$

Panel 8

$$-1.04I + 2.54H = .48$$

$$2.52I - .90H = 0$$

$$H = .22, I = .08, R_8 = .22$$

$$M_{HI} = 4(.22 + .08/2 - .22) = .16$$

$$M_{IH} = 4(.08 + .22/2 - .22) = -.12$$

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

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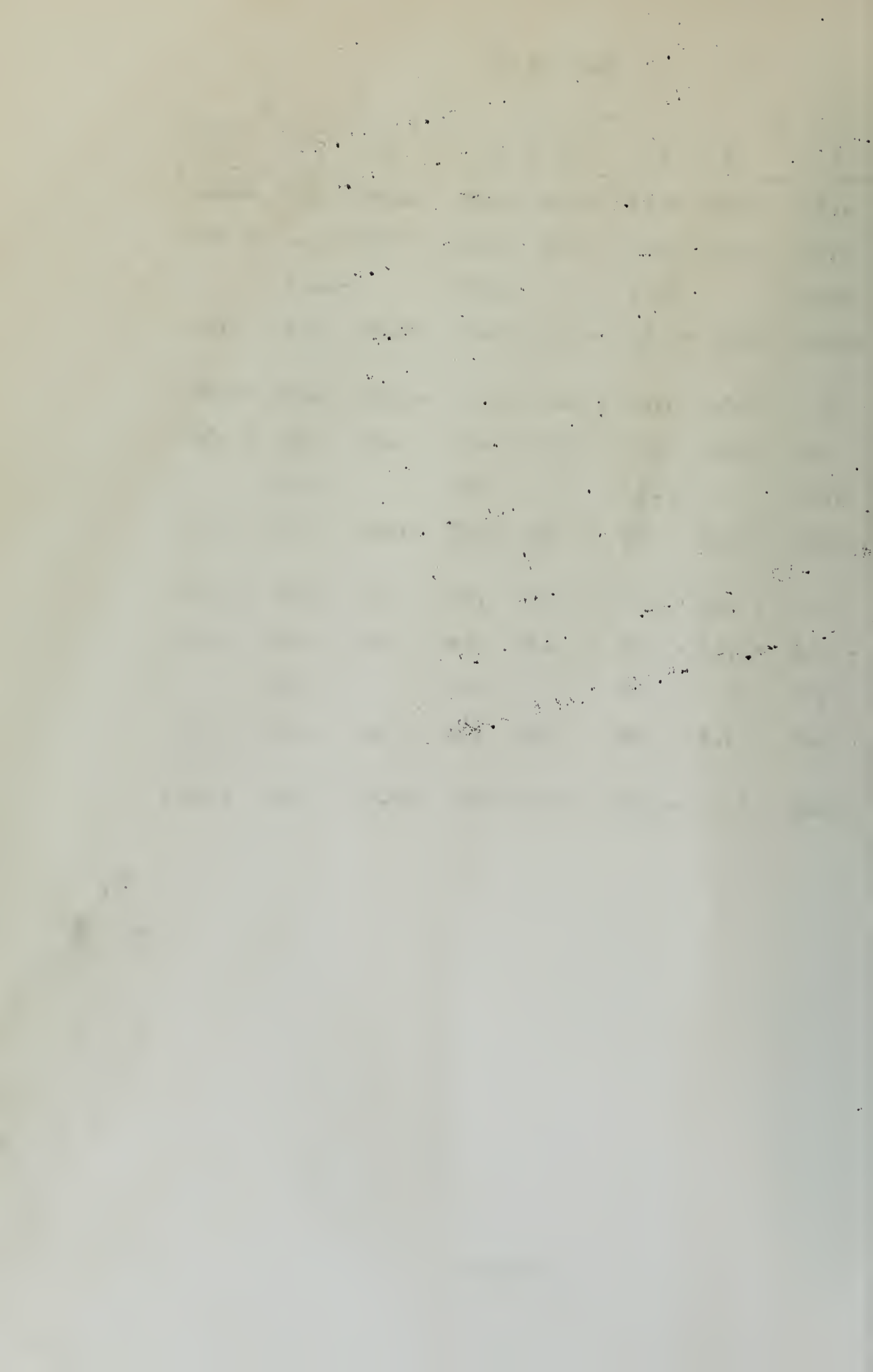
1954

Load at D

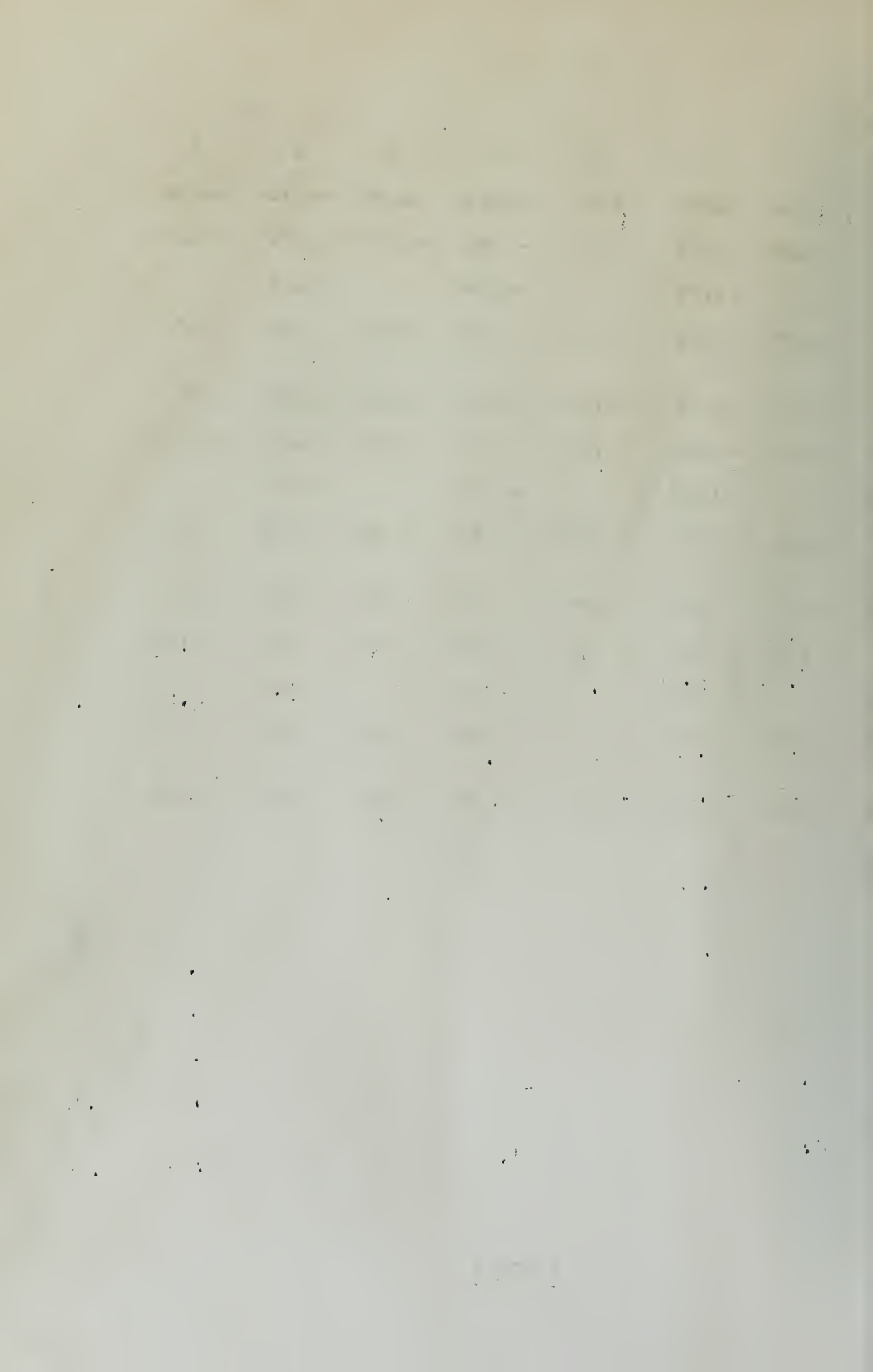
| anel | 1 | | 2 | | 3 | | 4 | |
|------|-------|-------|-------|-------|-------|-------|-------|-------|
| oint | A | B | B | C | C | D | D | E |
| Q | 4.38 | 4.49 | 4.31 | 4.36 | 3.98 | 4.12 | -2.82 | -2.82 |
| α | 2.79 | 2.91 | 2.33 | 1.66 | 1.21 | .96 | - .61 | - .48 |
| R | 5.40 | | 4.09 | | 2.99 | | -2.23 | |
| W | -4.64 | -4.40 | -3.72 | -5.08 | -3.90 | -4.29 | 2.76 | 2.90 |
| Q | 0 | 3.72 | 4.40 | 3.90 | 5.08 | -2.76 | 4.29 | -2.88 |
| | .61 | 1.72 | 2.32 | 1.55 | 1.28 | - .34 | .82 | - .38 |
| R | 1.74 | | 2.90 | | .72 | | .33 | |
| W | -1.08 | 1.08 | .80 | - .76 | 1.17 | -1.26 | .60 | - .60 |
| Q | 0 | - .80 | -1.08 | -1.17 | .76 | - .60 | 1.26 | - .04 |
| | - .13 | - .37 | - .59 | - .44 | .18 | - .09 | .25 | .01 |
| R | - .37 | | - .77 | | .08 | | .20 | |
| W | .24 | - .24 | - .16 | .16 | .18 | - .24 | .10 | - .14 |
| M | -5.48 | -3.56 | -3.08 | -5.68 | -2.53 | -5.79 | 3.46 | 2.16 |

Load at D

| nel | 1 | | 2 | | 3 | 4 | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|
| int | A | B | B | C | C | D | D | E |
| Q | 4.38 | 4.49 | 4.31 | 4.36 | 3.98 | 4.12 | -2.82 | -2.82 |
| X | 2.79 | 2.91 | 2.33 | 1.66 | 1.21 | .96 | - .61 | - .48 |
| R | 5.40 | | 4.09 | | 2.99 | | -2.23 | |
| M | -4.64 | -4.40 | -3.72 | -5.08 | -3.90 | -4.29 | 2.76 | 2.90 |
| Q | 0 | 3.72 | 4.40 | 3.90 | 5.08 | -2.76 | 4.29 | -2.88 |
| | .61 | 1.72 | 2.32 | 1.55 | 1.28 | - .34 | .82 | - .38 |
| R | 1.74 | | 2.90 | | .72 | | .33 | |
| M | -1.08 | 1.08 | .80 | - .76 | 1.17 | -1.26 | .60 | - .60 |
| Q | 0 | - .80 | -1.08 | -1.17 | .76 | - .60 | 1.26 | - .04 |
| | - .13 | - .37 | - .59 | - .44 | .18 | - .09 | .25 | .01 |
| R | - .37 | | - .77 | | .08 | | .20 | |
| M | .24 | - .24 | - .16 | .16 | .18 | - .24 | .10 | - .14 |
| M | -5.48 | -3.56 | -3.08 | -5.68 | -2.53 | -5.79 | 3.46 | 2.16 |



| | 5 | | 6 | | 7 | | 8 | |
|------|-------|-------|-------|-------|-------|-------|-------|--|
| E | F | F | G | G | H | H | I | |
| 2.82 | -2.82 | -2.46 | -2.37 | -2.61 | -2.58 | -2.70 | -2.64 | |
| .48 | - .60 | - .57 | - .72 | - .99 | -1.39 | -1.74 | -1.68 | |
| 2.22 | | -1.77 | | -2.46 | | -3.24 | | |
| 2.88 | 2.76 | 2.52 | 2.25 | 3.12 | 2.40 | 2.64 | 2.76 | |
| 2.90 | -2.52 | -2.76 | -3.12 | -2.25 | -2.64 | -2.40 | 0 | |
| .49 | - .55 | - .66 | - .93 | - .91 | -1.38 | -1.11 | - .39 | |
| .78 | | -1.20 | | -1.71 | | -1.12 | | |
| .04 | - .02 | .21 | - .18 | .44 | - .48 | - .72 | .72 | |
| .60 | - .21 | .02 | - .44 | .18 | .72 | .48 | 0 | |
| .09 | - .03 | - .01 | - .12 | .13 | .33 | .22 | .08 | |
| .04 | | - .10 | | .35 | | .22 | | |
| .08 | - .06 | .09 | - .09 | - .24 | .20 | .16 | - .12 | |
| 3.00 | 2.68 | 2.82 | 1.98 | 3.32 | 2.12 | 2.08 | 3.36 | |



Influence Line Corrections - First Set - Load at E

anel 1,8

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = 2.96$$

$$A = .49, B = 1.37, R_1 = 1.39$$

$$M_{AB} = 4(.49 + 1.37/2 - 1.39) = -.88$$

$$M_{BA} = 4(1.37 + .49/2 - 1.39) = .88$$

anel 2,7

$$2.52B - .93C = 3.52$$

$$-1.02B + 4.03C = 3.15$$

$$B = 1.86, C = 1.25, R_2 = 2.33$$

$$M_{BC} = 4(1.86 + 1.25/2 - 2.33) = .60$$

$$M_{CB} = 4(1.25 + 1.86/2 - 2.33) = -.60$$

anel 3,6

$$3.81C - .65D = 4.00$$

$$-.77C + 5.26D = 3.66$$

$$C = 1.20, D = .87, R_3 = 1.55$$

$$M_{CD} = 3(1.20 + .87/2 - 1.55) = .24$$

$$M_{DC} = 3(.87 + 1.20/2 - 1.55) = -.24$$

anel 4,5

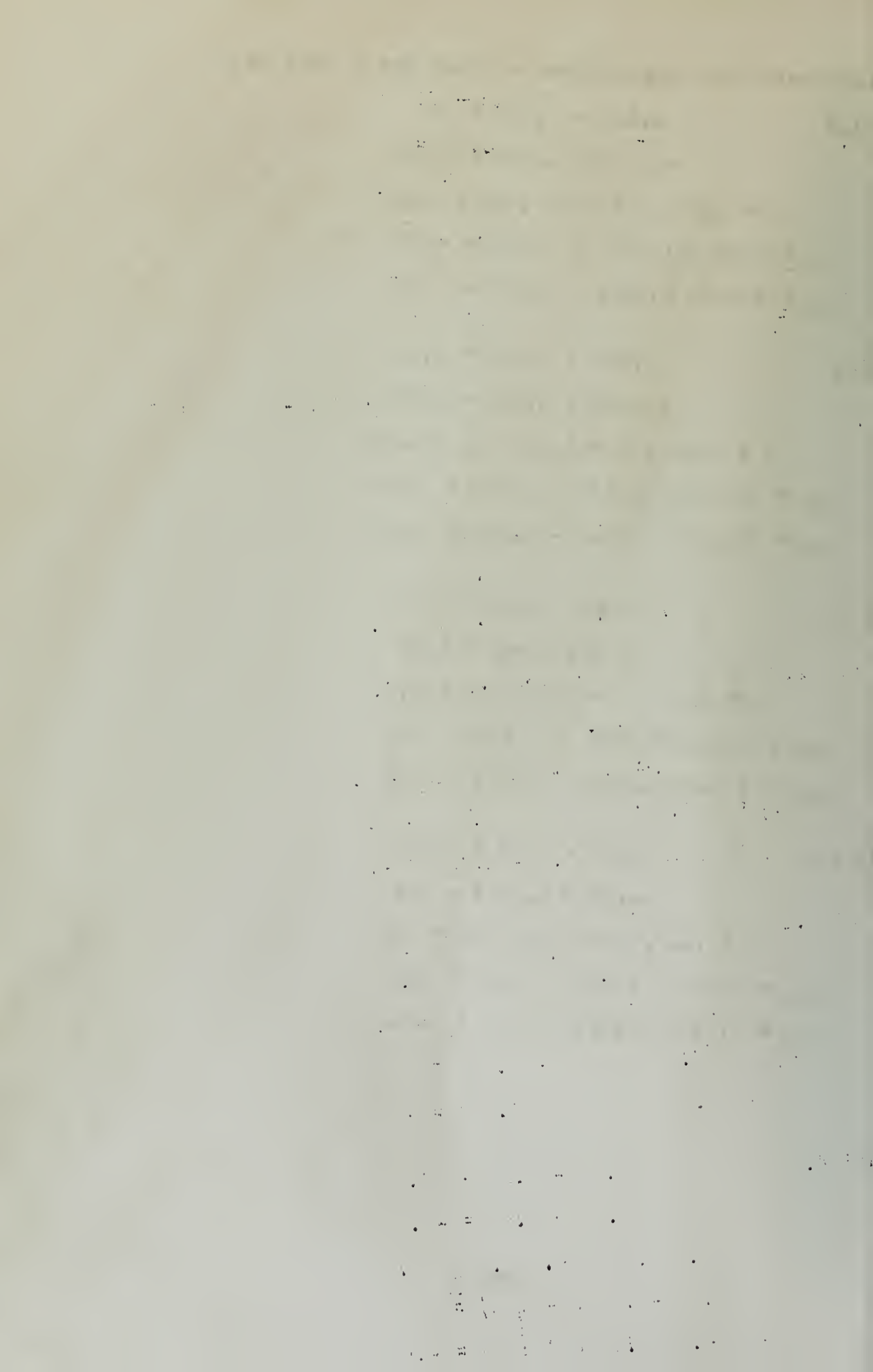
$$5.0D - .5E = 3.45$$

$$-1.5D + 6.5E = -.84$$

$$D = .64, E = -.54, R_4 = .08$$

$$M_{DE} = 2(.64 - .54/2 - .08) = .58$$

$$M_{ED} = 2(-.54 + .64/2 - .08) = -.60$$



Influence Line Corrections - Second Set - Load at E

Panel 1,8

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -.20$$

$$A = -.10, B = -.28, R_1 = -.28$$

$$M_{AB} = 4(-.10 - .28/2 + .28) = .16$$

$$M_{BA} = 4(-.28 - .10/2 + .28) = -.20$$

Panel 2,7

$$2.52B - .93C = -.88$$

$$-1.02B + 4.3C = -.24$$

$$B = -.41, C = -.16, R_2 = -.43$$

$$M_{BC} = 4(-.41 - .16/2 + .43) = -.24$$

$$M_{CB} = 4(-.16 - .41/2 + .43) = .24$$

Panel 3,6

$$3.81C - .65D = .60$$

$$-.77C + 5.26D = -.58$$

$$C = .14, D = -.09, R_3 = .04$$

$$M_{CD} = 3(.14 - .09/2 - .04) = .18$$

$$M_{DC} = 3(-.09 + .14/2 - .04) = -.18$$

Panel 4,5

$$5.1D - .51E = .24$$

$$-.5D + 6.5E = -.60$$

$$D = .04, E = -.09, R_4 = -.04$$

$$M_{DE} = 2(.04 - .09/2 + .04) = .06$$

$$M_{ED} = 2(-.09 + .04/2 + .04) = -.06$$

3. 10. 1950

1

4

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100

100

[illegible]

18

100

100

1. The first group of authors (e.g., Berman, 1984; Berman & ...)

1910-11-10. - 1910-11-11.

(continued)

Journal of Management Education 30(6)

100

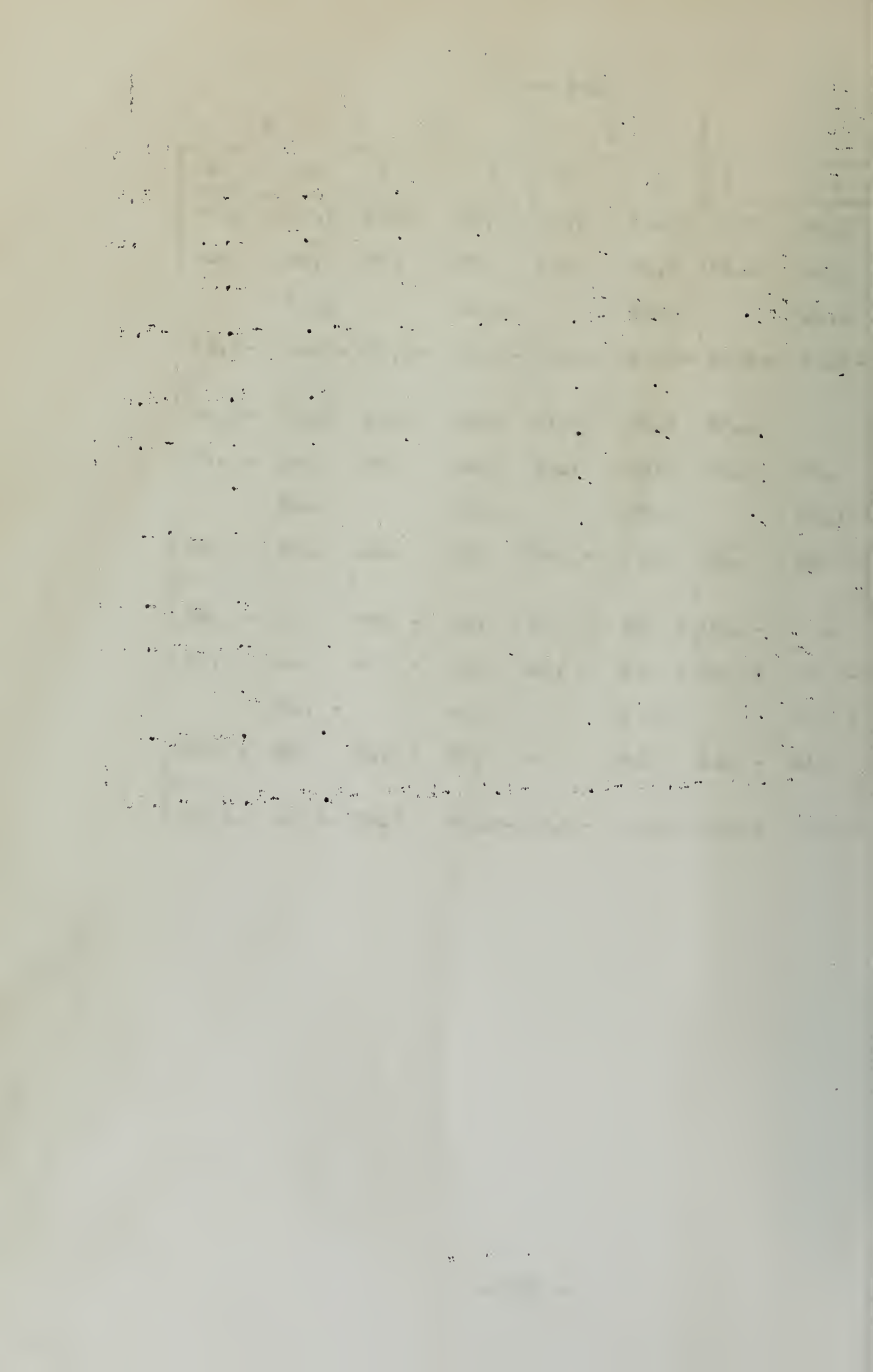
1990

1. The first group of people who are interested in the study of the history of the United States are the people who are interested in the history of the United States.

10

Load at E

| Panel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Point | A | B | B | C | C | D | D | E |
| Q | 3.51 | 3.59 | 3.44 | 3.49 | 3.18 | 3.30 | 3.25 | 3.75 |
| X | 2.22 | 2.33 | 1.86 | 1.33 | .97 | .77 | .82 | .64 |
| R | 4.32 | | 3.26 | | 2.40 | | 2.97 | |
| L | -3.76 | -3.52 | -2.96 | -4.00 | -3.15 | -3.45 | -3.66 | -3.84 |
| Q | 0 | 2.96 | 3.52 | 3.15 | 4.00 | 3.66 | 3.45 | -3.84 |
| X | .49 | 1.37 | 1.86 | 1.25 | 1.20 | .87 | .64 | -.54 |
| R | 1.39 | | 2.33 | | 1.55 | | .08 | |
| L | .88 | .88 | .60 | -.60 | .24 | -.24 | .58 | -.60 |
| Q | 0 | -.60 | -.88 | -.24 | .60 | -.58 | .24 | -.60 |
| X | .10 | -.28 | -.41 | -.16 | .14 | -.09 | .04 | -.09 |
| R | -.28 | | -.3 | | .04 | | .04 | |
| L | .16 | -.20 | -.24 | .24 | .18 | .18 | .06 | -.06 |
| L | -4.48 | -2.84 | -2.60 | -4.36 | -2.73 | -3.87 | -3.02 | -4.50 |



| | 5 | | 6 | | 7 | | 8 |
|------|-------|-------|-------|-------|-------|-------|--------|
| E | F | F | G | G | H | H | I |
| 3.75 | -3.75 | -3.30 | -3.18 | -3.49 | -3.44 | -3.59 | -3.51 |
| .64 | - .82 | - .77 | - .97 | -1.33 | -1.86 | -2.73 | -2.22 |
| 2.97 | | -2.40 | | -3.26 | | -4.32 | |
| 3.84 | 3.66 | 3.45 | 3.15 | 4.00 | 2.96 | 3.52 | 3.76 |
| 3.84 | -3.45 | -3.66 | -4.00 | -3.15 | -3.52 | -2.96 | 0 |
| .54 | - .64 | - .87 | -1.20 | -1.25 | -1.86 | -1.37 | - .149 |
| .08 | | -1.55 | | -2.33 | | -1.39 | |
| .60 | - .58 | .24 | - .24 | .60 | - .60 | - .88 | .88 |
| .60 | - .24 | .58 | - .60 | .24 | .88 | .60 | 0 |
| .09 | - .04 | .09 | - .14 | .16 | .41 | .28 | .10 |
| .04 | | - .04 | | .43 | | .28 | |
| .06 | - .06 | .18 | - .18 | .24 | .24 | .20 | - .16 |
| 4.50 | 3.02 | 3.87 | 2.73 | 4.36 | 2.60 | 2.84 | 4.48 |

Moment Computations - Web Members

Member AA' DL = 3510 fk
 LL-E60 = 3008
 Impact = 644
 Total = 7162

LL H15-S12-44 = 412
 Conc. = 97
 Impact = 70
 Total = 579

Sidewalk = 246

Design Moment = 7,937 fk

Member BB' DL = 3980 fk
 LL-E60 = 3395
 Impact = 725
 Total = 8100

LL H15-S12-44 = 465
 Conc. = 109
 Impact = 78
 Total = 652

Sidewalk = 278

Design Moment = 9,030 fk

Member CC' DL = 3690 fk
 LL-E60 = 3200
 Impact = 736
 Total = 7626

LL H15-S12-44 = 432
 Conc. = 101
 Impact = 80
 Total = 613

Sidewalk = 258

Design Moment = 8,497 fk

ber DD'

DL = 2422 f.k.

LL-E60 = 2193

Impact = 590

Total 5205

LL H15-S12 - 44 = 284

Conc. = 97

Impact = 66

Total = 447

Sidewalk = 192

Design Moment = 5,844 f.k.

ber EE'

DL = 1323 f.k.

LL-E60 = 1272

Impact = 445

Total = 3040

LL H15-S12-44 = 155

Conc. = 73

Impact = 47

Total = 275

Sidewalk = 120

Design Moment = 3,435 f.k.

Moment Computations - Chord Members

Member AB

| | | |
|--------|---|-----------|
| DL | = | 3510 f.k. |
| LL-E60 | = | 3008 |
| Impact | = | 644 |
| <hr/> | | |
| Total | = | 7162 |

| | | |
|---------------|---|-----|
| LL H15-S12-44 | = | 412 |
| Conc. | = | 97 |
| Impact | = | 70 |
| <hr/> | | |
| Total | = | 579 |
| Sidewalk | = | 246 |

Design Moment = 7,987 f.k.

Member BC

| | | |
|--------|---|-----------|
| DL | = | 3120 f.k. |
| LL-E60 | = | 2800 |
| Impact | = | 642 |
| <hr/> | | |
| Total | = | 6562 |

| | | |
|---------------|---|-----|
| LL H15-S12-44 | = | 365 |
| Conc. | = | 105 |
| Impact | = | 71 |
| <hr/> | | |
| Total | = | 541 |

Sidewalk = 226

Design Moment = 7,329 f.k.

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er CD

| | | |
|---------------|---|------|
| DL | = | 1828 |
| W-E60 | = | 1692 |
| Impact | = | 434 |
| <hr/> | | |
| Total | = | 3954 |
| LL H15-S12-44 | = | 214 |
| Conc. | = | 78 |
| Impact | = | 49 |
| <hr/> | | |
| Total | = | 341 |
| Sidewalk | = | 141 |

Design Moment = 4,436 f.k.

er DE

| | | |
|---------------|---|------|
| DL | = | 1172 |
| W-E60 | = | 1138 |
| Impact | = | 342 |
| <hr/> | | |
| Total | = | 2652 |
| LL H15-S12-44 | = | 137 |
| Conc. | = | 61 |
| Impact | = | 37 |
| <hr/> | | |
| Total | = | 235 |
| Sidewalk | = | 99 |

Design Moment = 2,986 f.k.

1891
 1892
 1893

1894
 1895
 1896

1897
 1898
 1899

1900
 1901
 1902

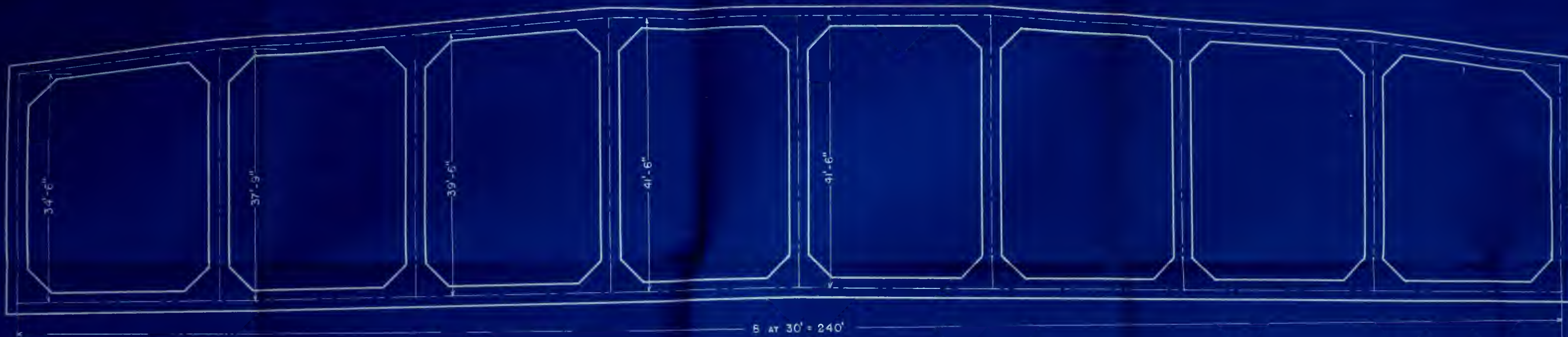
1903
 1904
 1905

1906
 1907
 1908

1909
 1910
 1911

1912
 1913
 1914

1915
 1916
 1917



$$m = \frac{37.75 - 34.50}{37.75} = 0.0866$$

$$m = \frac{39.50 - 37.75}{39.50} = 0.0443$$

$$m = \frac{41.50 - 39.50}{41.50} = 0.0482$$

$$m = \frac{41.50 - 41.50}{41.50} = 0$$

$$m = \frac{41.50 - 41.50}{41.50} = 0$$

$$m = \frac{41.50 - 39.50}{41.50} = 0.0482$$

$$m = \frac{39.50 - 37.75}{39.50} = 0.0443$$

$$m = \frac{37.75 - 34.50}{37.75} = 0.0866$$

$$n = \frac{37.75 - 34.50}{34.50} = 0.0942$$

$$n = \frac{39.50 - 37.75}{37.75} = 0.0463$$

$$n = \frac{41.50 - 39.50}{39.50} = 0.0507$$

$$n = \frac{41.50 - 41.50}{41.50} = 0$$

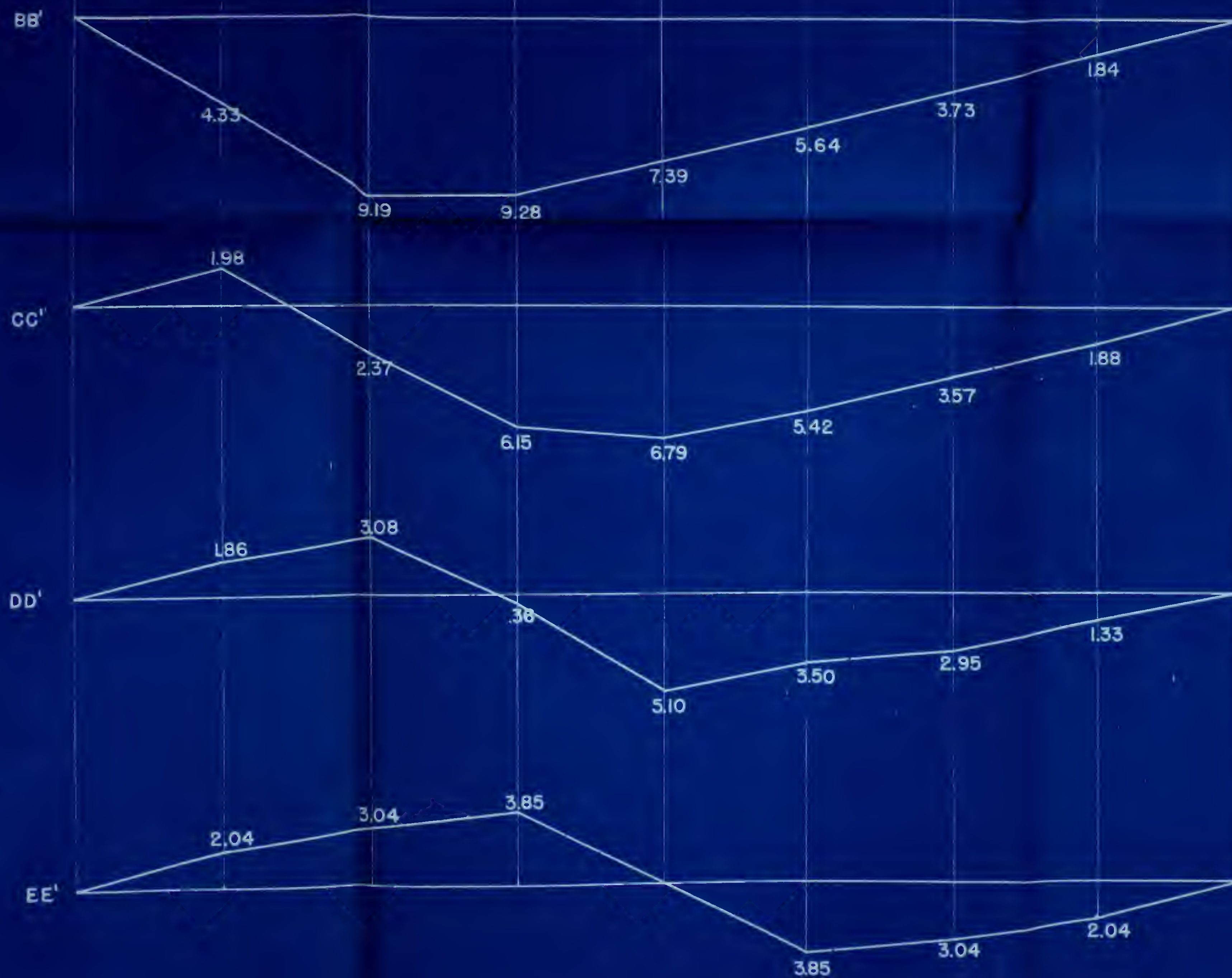
$$n = \frac{41.50 - 41.50}{41.50} = 0$$

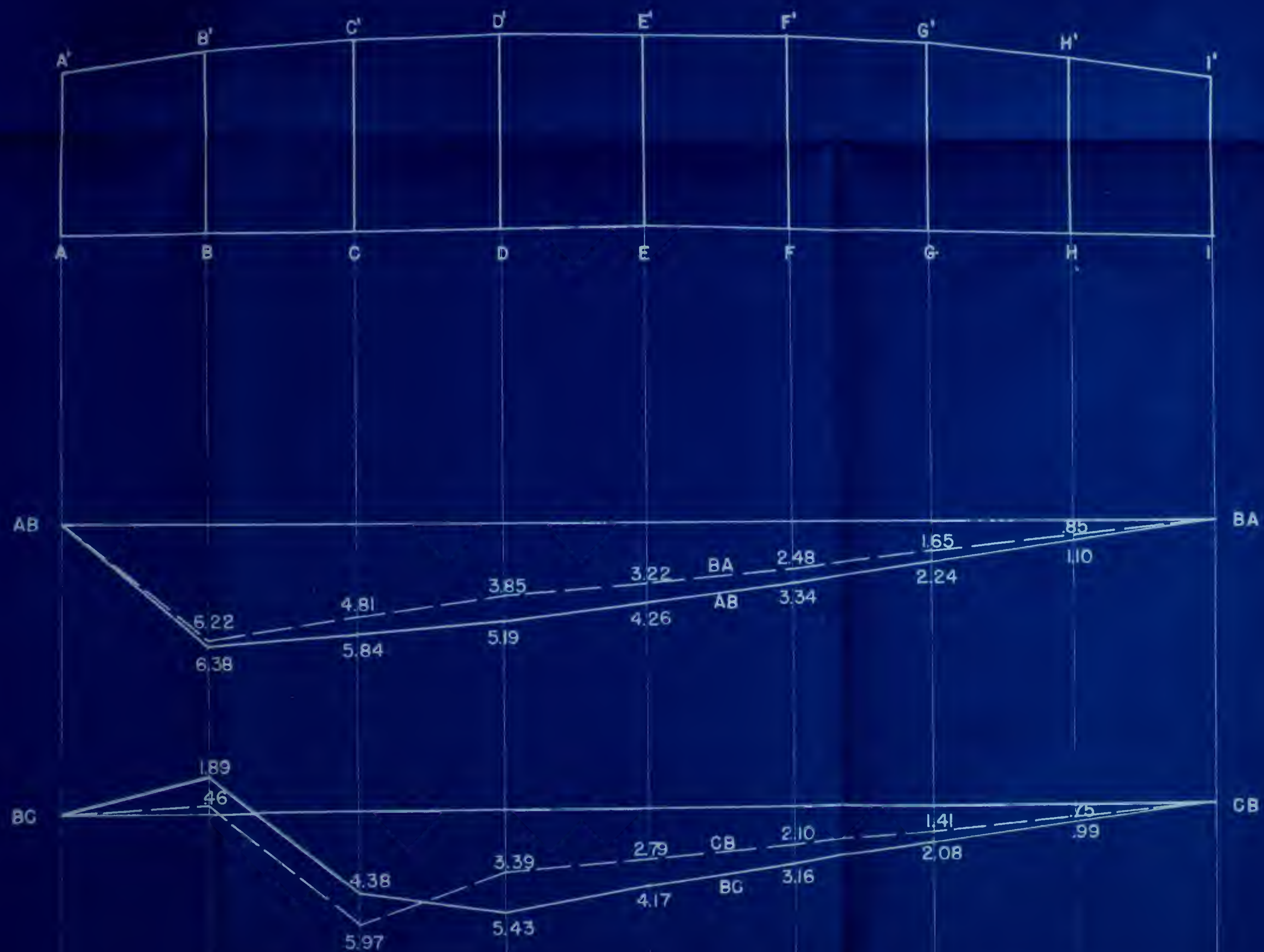
$$n = \frac{41.50 - 39.50}{39.50} = 0.0507$$

$$n = \frac{39.50 - 37.75}{37.75} = 0.0463$$

$$n = \frac{37.75 - 34.50}{34.50} = 0.0942$$

ELEVATION
VIERENDEEL TRUSS
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J. J. MANNING JR.
SCALE 1" = 10'
L. H. EDING







INFLUENCE LINES

FIRST SET

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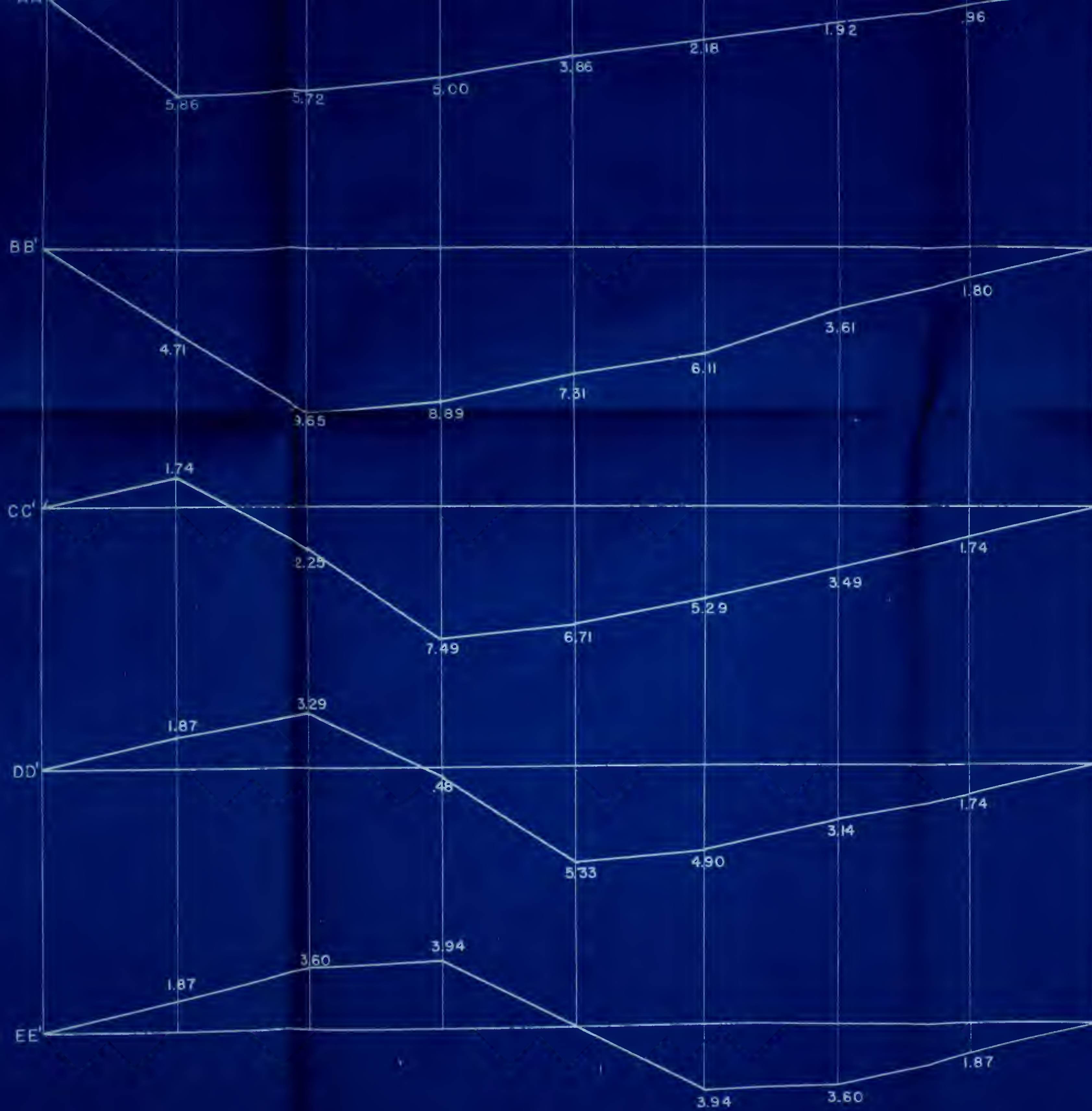
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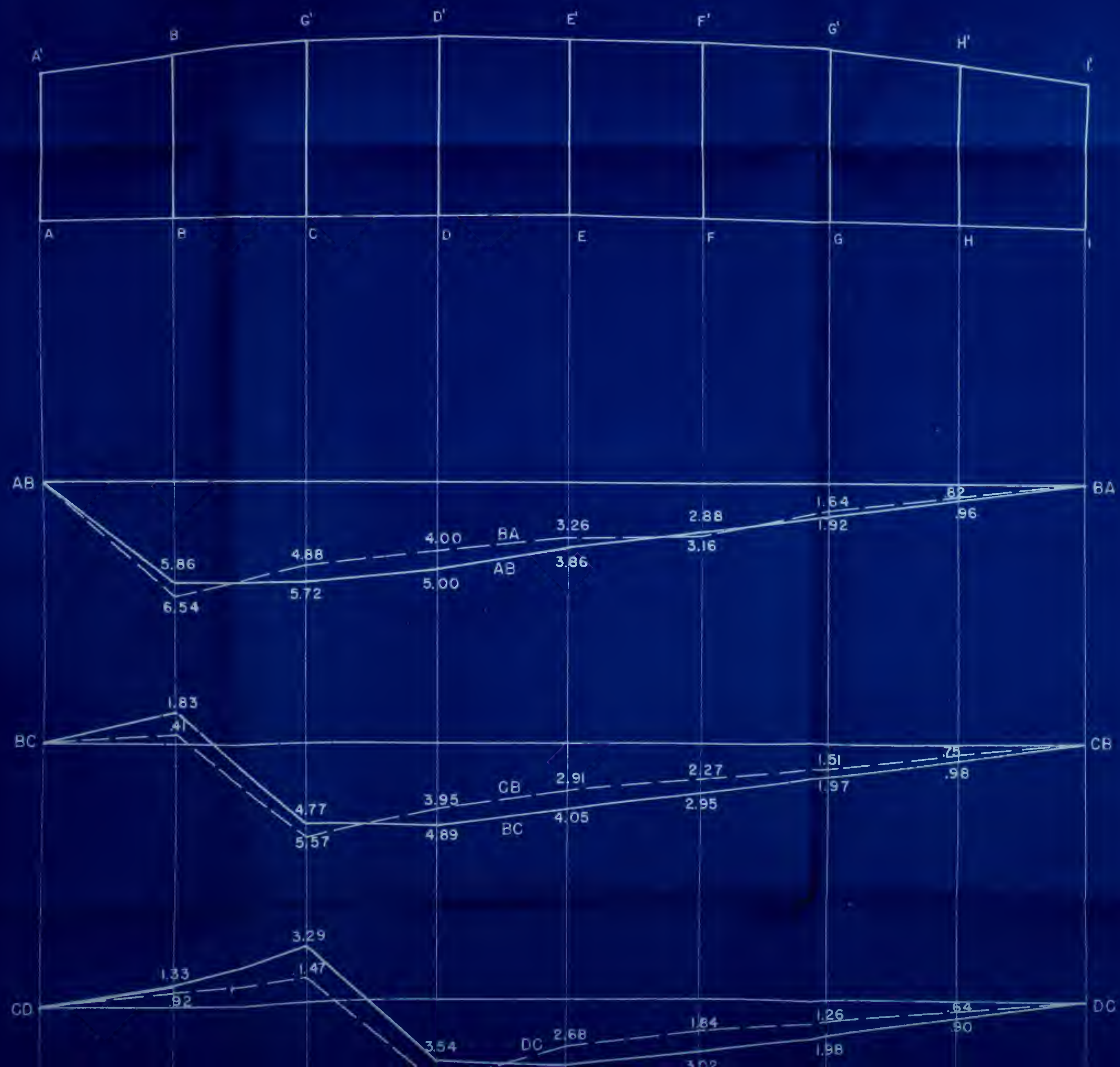
JUNE 1948

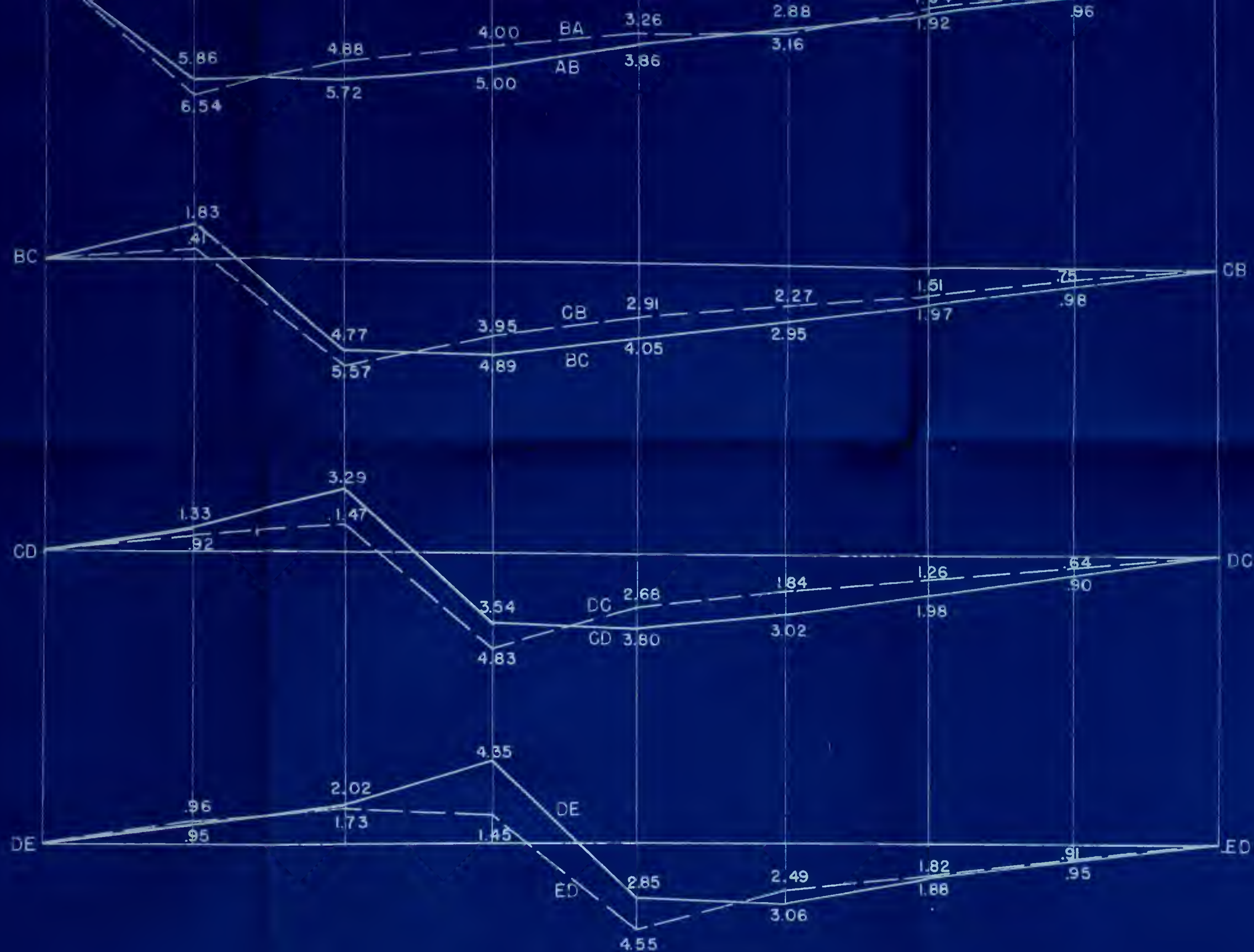
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1" = 5 F.T.

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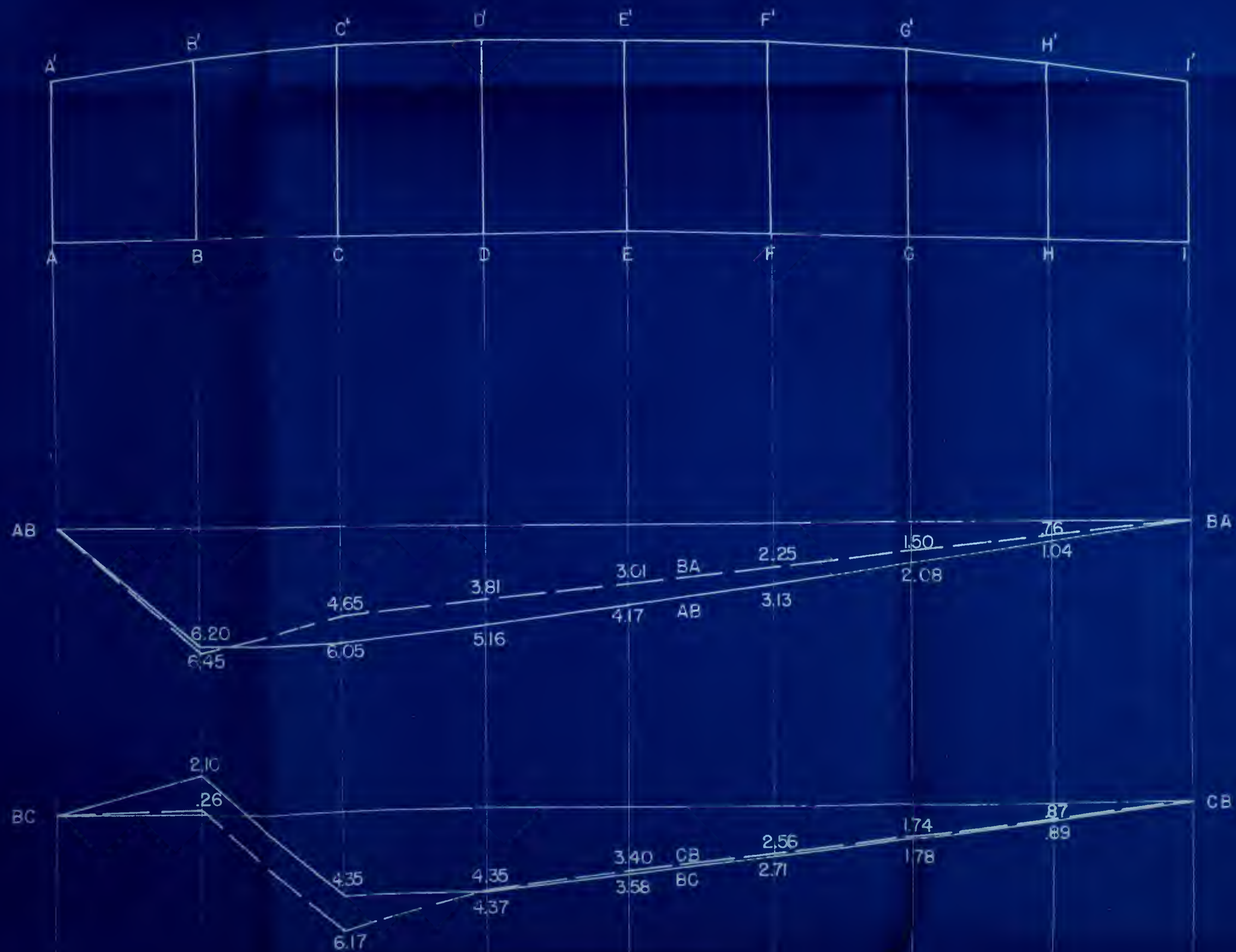
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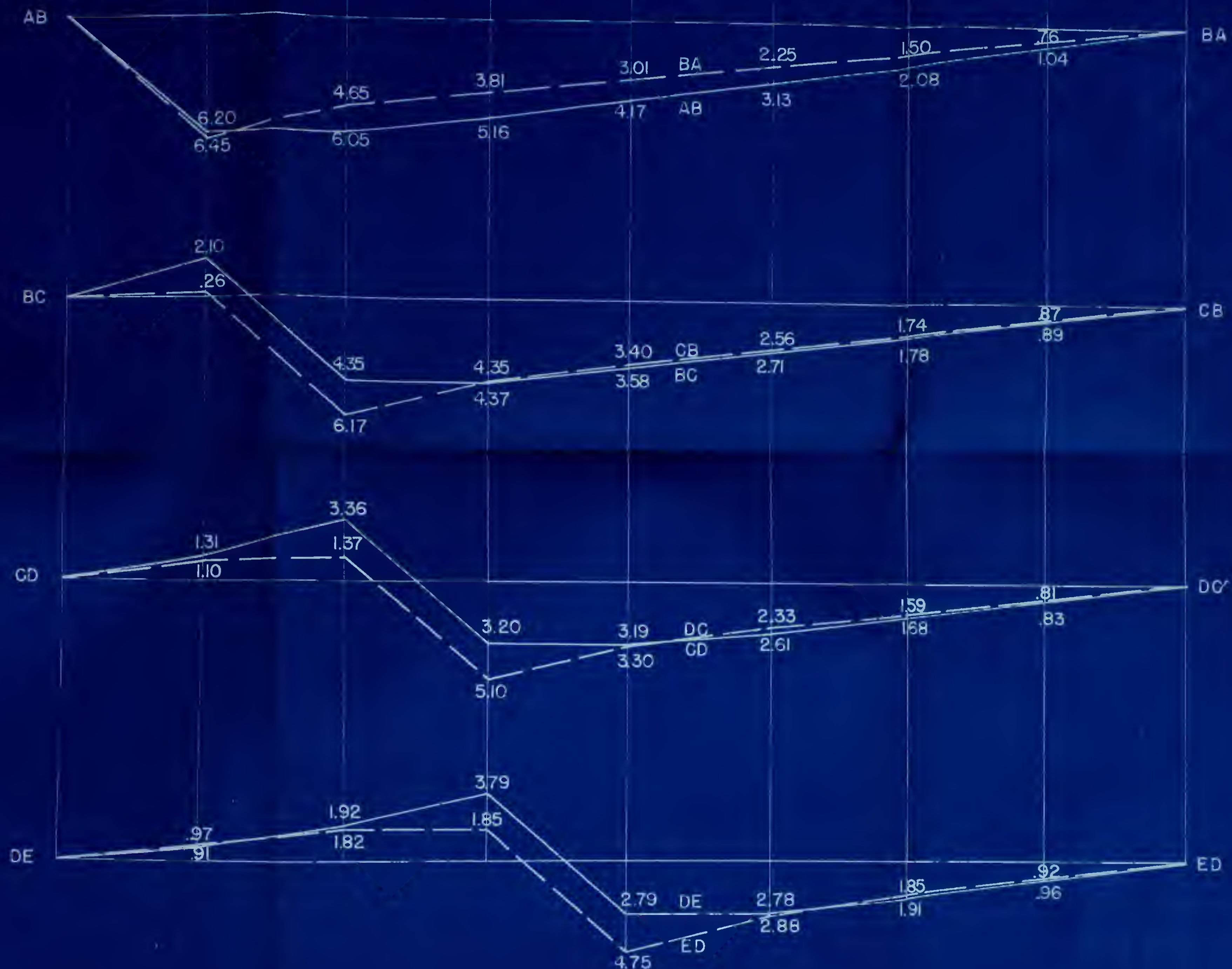
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INFLUENCE LINES

THIRD SET

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1"=5 F.K.

L. H. EDING



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1" = 5 F. K. L. H. EDING

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Thesis

6889

M3 Manning

Investigation of the
effect of stiffness of
members upon the solution
of Vierendeel trusses.

Thesis

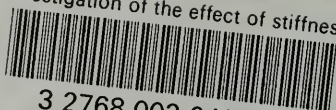
6889

M3 Manning

Investigation of the
effect of stiffness of
members upon the solution
of Vierendeel trusses.

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Investigation of the effect of stiffness



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